NAVSHIPS 91684

45

INSTRUCTION BOOK

for

RADIO TRANSMITTING SET AN/URT-7

FEDERAL TELEPHONE AND RADIO CORPORATION
CLIFTON, NEW JERSEY

BUREAU OF SHIPS NAVY DEPARTMENT

#45

RADIO TRANSMITTING SET Author

AN/URT-7 Title

DATE DUE	BORROWER'S NAME, RANK OR RATE— DIVISION OR UNIT *(Please print)*

TEMPORARY CORRECTION T-2 TO INSTRUCTION BOOK FOR RADIO TRANSMITTING SET AN/URT-7.

This temporary correction is in effect immediately. It changes the book to cover the "B" model of Radio Transmitting Set AN/URT-7, manufactured under contract NObsr-64523 by the Rauland-Borg Corporation, Chicago, Illinois.

Make the following changes in pen and ink. Then insert this temporary correction in the instruction book, just after the front cover and just ahead of the title page. Do not make these changes until Temporary Correction T-1 changes have been made.

PAGE	PARAGRAPH OR FIGURE	LINE OR LOCATION	ACTION
All pages			Make the following changes, everywhere that they appear in the instruction book, except where otherwise stated. Where corrections or additions are required on single spaced print, place asterisk at point where addition is to be made and include addition or change as a footnote.
			Change "AN/URT-7 and 7A" to "AN/URT-7, 7A, and 7B", except figure 7-28A.
1-0	Figure 1-1		Add "T-336B/URT" after "T-336A/URT".
1-1	2		"
1-1	3-a		"
1-2	Figure 1-2		"
1-5	1-1		"
1-6	T1-4		"
2-2	Figure 2-1		"
3-0	Figure 3-1		"
3-1	1-b		"
3-1	2		"
3-4	5		"
3-5	Figure 3-5		"
3-7	Figure 3-7		"
4-2	Figure 4-1A		"
4-4	5		"
7-1	2a		"
1-1	3		Add "MD-163B/URT" after "MD-163A/URT"
1-1	3a(2)		"
1-2	Figure 1-2		"

PAGE	PARAGRAPH OR FIGURE	LINE OR LOCATION	ACTION
1-4	Figure 1-4		Add "MD-163B/URT" after "MD-163A/URT".
1-5	T1-1		"
1-6	T1-4		"
2-1	1		"
2-1	P1b		"
2-2	Figure 2-1		"
2-6	2b		"
2-8	Figure 2-5A		"
7-1	2a		"
7-19	Figure 7-16		"
1-1	3		Add "AM-638B/URT" after "AM-638A/URT".
1-1	3a(3)		"
1-2	Figure 1-2		"
1-4	Figure 1-4		"
1-5	T1-1		"
1-6	T1-4		"
2-1	1		"
2-1	1a		"
2-2	Figure 2-1		"
2-3	2a		"
7-1	2a		"
7-12	Figure 7-9		"
1-1	3		Add "PP-773B/URT" after "PP-773A/URT".
1-1	3a(1)		"
1-2	Figure 1-2		"
1-3	Figure 1-3		"
1-5	T1-1		"
1-6	T1-4		"
2-1	1		"

TEMPORARY CORRECTION T-3 TO INSTRUCTION BOOK FOR RADIO TRANSMITTING SETS AN/URT-7, 7A, 7B NAVSHIPS 91684

This temporary correction supersedes CHANGE 3 to NAVSHIPS 91684, and is in effect only after FIELD CHANGE 1 - AN/URT-7, 7A has been accomplished.

CHANGE 3 (published June 15, 1955) was inadvertently prepared to correct the basic NAVSHIPS 91684 instead of NAVSHIPS 91684 as corrected by Temporary Corrections T-1 and T-2 and Permanent Changes 1 and 2. In the attempt to incorporate CHANGE 3 into a copy of NAVSHIPS 91684 which contains T-1, T-2, Changes 1 and 2, it will be realized that CHANGE 3 cannot be integrated. In the event pages of the book have been discarded while attempting to integrate CHANGE 3, new copies of NAVSHIPS 91684 and T-1, T-2, Changes 1 and 2 should be requisitioned. This Temporary Correction (T-3) can be incorporated without confusion into NAVSHIPS 91684 with associated revisions (T-1, T-2, Change 1 and Change 2).

This temporary correction modifies the instruction book to reflect the equipment changes made by FIELD CHANGE 1-AN/URT-7, and 1-AN/URT-7A. The Field Change applies to models AN/URT-7 and AN/URT-7A, and its purpose is to add protective features to the equipment and to improve performance.

FIELD CHANGE 1-AN/URT-7, and 1-AN/URT-7A adds parts K404, R195, P404 and P405 and replaces existing K403 with a new relay. This modification modernizes the AN/URT-7 and the AN/URT-7A to include design features incorporated in the AN/URT-7B thus, specific items of information in the instruction book must be corrected in order that the book will continue to cover information pertaining to AN/URT-7B, as well as AN/URT-7 and AN/URT-7A when modified by Field Change 1.

Make the following pen and ink corrections. Insert this Temporary Correction in the technical manual immediately after the front cover and preceeding T-2.

PAGE NO.	CHANGE IN EFFECT	PARA & LINE OR FIG & LOCATION	ACTION
1-0	Orig. & T-2	Fig. 1-1	Delete "CX-1828/U" and "for AN/URT-7B".
1-1	Orig. & T-2	Par. 2, line 4	Delete "CX-1828/U" and "for AN/URT-7B".
1-4	Orig. & T-2	Par. 3b, line 13	Delete "CX-1828/U" and "for AN/URT-7B".
1-5	Orig. & T-2	Table 1-1, third column	Delete "CX-1828/U" and "for AN/URT-7B".
2-8A	Ch. 2	Fig. 2-6	Delete Fig. 2-6.
2-8A	Ch. 2	Fig. 2-6A Title	Change "for MD-163B/URT" to "MC-163/URT, MD-163A/URT and MD-163B/URT".
2-9	Ch. 2	Par. 2b(5) line 23	Delete "In model AN/URT-7B,".
2-13	Orig.	Fig. 2-10	Delete.
2-14	Ch. 2	Fig. 2-10A Title	Change "for AN/URT-7B" to "for AN/URT-7, 7A & 7B".
2-14A	Ch. 2	Par. 2c(1), line 17	Delete "In model AN/URT-7B".
2-19	Ch. 2	Par. 2e(22) lines 5 and 6	Delete "In model AN/URT-7B, a fifth relay", and "added as"
2-19	Ch. 2	Par. 2e(22) line 29	Delete "On model AN/URT-7B".
3-1	Orig.	Par. 1a, line 6	Delete "CX-1828/U" and "for AN/URT-7B".
4-2A	Ch. 2	Par. 2g, line 3	Delete "On model AN/URT-7B".
4-3	Orig.	Par. 2p. NOTE	Delete "On model AN/URT-7B".
5-1	Orig	Par. 2a, line 12	Add the following: "See figure 5-1A for the location of C195."

PAGE NO.	CHANGE IN EFFECT	PARA & LINE OR FIG & LOCATION	ACTION
6-0A	Ch. 2	Table 6-4, item 2, first column	Delete "On model AN/URT-7B".
7-2	Orig.	Fig. 7-2	Delete "CX-1828/U" and "for AN/URT-7B".
7-3	Orig.	Par. 2c, (3)	Delete "CX-1828/U" and "for AN/URT-7B".
7-4	Orig.	Table 7-1, eighth item, first column	Delete "model AN/URT-7B only".
7-8	Orig.	Fig. 7-4. NOTES	Delete "115 VAC ... AN/URT-7B" and add: "115 VAC between pins 8 and 9, and 11 and 9".
7-10	Orig.	Fig. 7-6	Add the following note: "See figure 7-6A for new relay K403".
7-10B	Orig.	Fig. 7-7	Add the following note: "See figure 7-7A for location of thermal relay K404".
7-13	Orig.	Fig. 7-10	Add the following note: "See figure 7-10A for the location of blower connectors P404 and P405".
7-16	Ch. 2	Fig. 7-13	At pin 6 of XV104 delete "V310" and "R85,000", and delete the "±" at V270.
7-18A	Orig.	Fig. 7-15	Add the following note: "For the locations of C195 and R195 see figure 7-15A".
7-37 7-38	Orig.	Fig. 7-28	Add the following note in a conspicuous location: "For the connections of C195, R195, new K403, K404, P404 and P405 see figure 7-28B".
7-38A 7-38B	Ch. 1	Fig. 7-28A	Add the following note in a conspicuous location: "For the connections of C195, R195, new K403, K404, P404 and P405 see figure 7-28B.
7-43 7-44	Orig.	Fig. 7-31	Add the following note in a conspicuous location: "For the connections of R195 and C195 see figure 7-31B".
7-44A 7-44B	Ch. 1	Fig. 7-31A	Add the following note in a conspicuous location: "For the connections of R195 and C195 see figure 7-31B".
7-45 7-46	Orig.	Fig. 7-32	Add the following note in a conspicuous location: "For the connections of thermal relay K404 see figure 7-32A".
8-2B	Ch. 2	Table 8-1B	In the first column, add (†) to the right of the following: C-195***, K403***, K404***, P404***, P405***, R195***, and W303.1***.
8-2C	Ch. 2	Bottom margin	Add: "† also applies to models AN/URT-7 and AN/URT-7A".
8-19	Orig.	Table 8-2 K403	Delete, stock number, and description and locating function. In the description column add: "See K403*** in table 8-1B".
8-33	Orig.	Table 8-2 W303	Delete, stock number, name and description and locating function. In the description column add: "See W303.1*** in table 8-1B".

PAGE	PARAGRAPH OR FIGURE	LINE OR LOCATION	ACTION
2-2	Figure 2-1		Add "PP-773B/URT" after "PP-773A/URT".
2-3	1c		"
2-14	2c		"
5-4	Figure 5-3		"
7-1	2a		"
7-7	Figure 7-3		"
1-0	Figure 1-1		After "CX-1828/U" Add "(CX-3154/U for AN/URT-7B)".
1-1	2		"
1-4	3b		"
1-5	T1-1		"
3-1	1		"
7-2	Figure 7-2		"
7-3	2c(3)		"
1-1	3		Add "CY-1126B/URT" after "CY-1126A/URT".
1-2	Figure 1-2		"
1-3	3a(4)		
1-5	T1-1		
3-6	Figure 3-6		
1-4	4b	2	Add "and NObsr-64523, 30 July 1954".
2-1	1	8	Change "figures 7-28 and 7-28A" to figures 7-28, 7-28A, and 7-28B.
2-4	Figure 2-3	C615	Change "C615 is 20 uuf on model AM-638A/URT" to "C615 is 20 uuf on model AM-638A/URT and AM-638B/URT"
2-5	Figure 2-4	C615	"
2-6	2b(1)	End of para.	Add "In models AN/URT-7A and AN/URT-7B, R104 and R109 serve as the plate load resistors".
2-8	2b(4)	11	After "figure 2-6" add "and figure 2-6A".
2-8	2b(5)	3	After "figure 2-6" add "and 2-6A".
2-15	2c(3)	2	After ("See Figure 2-10") add "and figure 2-10A".

PAGE	PARAGRAPH OR FIGURE	LINE OR LOCATION	ACTION
2-17	Figure 2-13	Block 2 at C615	Change "C615 is 20 uuf on model AM-638A/URT" to "C615 is 20 uuf on models AM-638A/URT and AM-638B/URT"
3-0	Figure 3-1	Eqpt Spare Parts Chest and Shipping case.	Change "not applicable to model AN/URT-7A" to "not applicable to models AN/URT-7A and AN/URT-7B".
3-2	2h	3	After "figure 3-3" add "and figure 3-3A".
4-3	2p		Add after paragraph "p" the following note: "NOTE" On model AN/URT-7B, automatic shut-down of equipment is provided when the blower motor does not operate.
5-2	Table 5-1	Col. 3 Item 1	Add: "On model AN/URT-7B, equipment will stop automatically if the blower motor fails".
7-3	2d(1)		After "figure 7-28 and 7-28A" add: "and 7-28B"
7-4	Table 7-1	Col. 1 Col. 2 Col. 3	Add the following at end of table: "8. Equipment shuts itself off (Model AN/URT-7B only)". "8. Blower motor inoperative" "8. Check blower motor".
7-38A and 7-38B	Figure 7-28A		Add note 10 to table of notes. "10. Refer to table 7-5A for coil winding data".
7-38C and 7-38D	Figure 7-28B		Add note 11 to table of notes. "11. Refer to table 7-5A for coil winding data."

Instructions for inserting revision pages and making the pen and ink corrections contained in CORRECTION T-2 to correct INSTRUCTION BOOK for RADIO TRANSMITTING SET AN/URT-7A (NAVSHIPS 91684) to incorporate the "B" model.

Remove title page and insert new title page.

Pages iii, iv, iv-a, v, and vi; remove pages iii, iv, v, and vi and insert pages iii, iv, iv-a, v, and vi.

Pages 2-8A, 2-9, and 2-10; remove and insert pages 2-8A, 2-9, and 2-10.

Pages 2-13, 2-14, and 2-14A; remove pages 2-13, and 2-14 and insert pages 2-13, 2-14, and 2-14A.

Pages 2-19 and 3-0; remove and insert pages 2-19 and 3-0.

Page 3-2A; insert after page 3-2.

Page 4-2A; remove and insert after page 4-2.

Page 5-2A; insert after page 5-2.

Page 6-0A; insert after page 6-0.

Pages 6-1 and 7-0; remove and insert pages 6-1 and 7-0.

Pages 7-10A and 7-10B; insert pages 7-10A and 7-10B.

Pages 7-11, 7-12, 7-13, 7-14, 7-15, 7-16, 7-17, 7-18, 7-18A, 7-18B, 7-19, 7-20, and 7-20A; remove pages 7-11 to 7-20 and insert pages 7-11 to 7-20A.

Page 7-28A; insert after page 7-28.

Pages 7-38C and 7-38D; insert after page 7-38B.

Pages 7-42A and 7-42B; insert after page 7-42.

Pages 7-44C and 7-44D; insert after page 7-44B.

Pages 7-46A and 7-46B; insert after page 7-46.

Pages 8-2A, 8-2B, 8-2C, and 8-2D; remove pages 8-2A and 8-2B and insert pages 8-2A, 8-2B, 8-2C, and 8-2D.

Pages 8-36A and 8-36B; insert after page 8-36.

TEMPORARY CORRECTION FOR T-1 TO INSTRUCTION BOOK FOR RADIO TRANSMITTING SET AN/-URT-7.

This temporary correction is in effect immediately. It changes the book to cover the "A" model of Radio Transmitting Set AN/URT-7, manufactured under contract NObsr-64523 by the Rauland-Borg Corporation, Chicago, Illinois.

Make the following changes in pen and ink. Then insert this temporary correction, in the instruction book, just after the front cover and just ahead of the title page.

PAGE	PARA & LINE or FIG & LOCATION		ACTION
All pages			Make the following changes, everywhere that they appear, in the instruction book, except where otherwise stated.
			Change "AN/URT-7" to "AN/URT-7 and 7A".
			Change "NObsr-52311" to "NObsr-52311 and NObsr-64523"
			Change "T-336/URT" to "T-336/URT and T-336-A/URT".
			Change "PP-773/URT" to "PP-773/URT and PP-773A/URT.
			Change "MD-163/URT" to "MD-163/URT and MD-163A/URT".
			Change "AM-638/URT" to "AM-638/URT and AM-638A/URT".
			Change "CY-1126/URT" to "CY-1126/URT and CY-1126A/URT".
1-4	4b	2	Add "and NObsr-64523, 30 July 1954."
	4c	3	Add "and Inspector of Naval Material Inspection, Naval Material, Chicago, Illinois".
	4d		Add "and Rauland-Borg Corp., Chicago, Ill." .
2-1	1	8	Change "figure 7-28" to "figures 7-28 and 7-28A".
2-4	Figure 2-3		Add a resistor "R609 2200" between L605 and C613.
2-4	Figure 2-3	C615	Add "C615 is 20 uuf on model AM-638A/URT".
2-4	2a(3)	19	Change "L605" to "L605 and resistor R609".
2-5	Figure 2-4	C615	Add "C615 is 20 uuf on model AM-638A/URT".
2-6	2b(1)	4	Change "figure 2-5" to "figures 2-5 and 2-5A".
	2b(1)	19	Change "R104 serves" to "R104 and R190 serve".
	2b(2)	2	Change "figure 2-5" to "figures 2-5 and 2-5A".

PAGE	PARA & LINE or FIG & LOCATION		ACTION
2-9	2b(7) (a)	8	Change "figure 2-5" to "figures 2-5 and 2-5A".
2-17	Figure 2-13	Block 2 at C615	Add "C615 is 20 uuf on model AM-638A/URT".
2-18	2e(12)	8	Change "figure 2-5" to "figures 2-5 and 2-5A".
2-19	2e(22)	7	Change "figures 2-8 and 7-28" to "figures 2-8, 7-28 and 7-28A".
3-0	Figure 3-1	Eqpt Spare Parts Chest and shipping case.	Add "not applicable to model AN/URT-7A".
3-7	Note c	2	Change "side of the" to "side, top and bottom of the".
3-9	Figure 3-10	Callouts	Change "J503" to "J502" and "J504" to "J503".
4-0	1b	9	Change "figure 4-1" to "figures 4-1 and 4-1A".
5-1	2a	End of para.	Add "See figure 4-1A for spare fuse location on model T-336A/URT-7".
5-3	Table 5-2	3rd item in LOCATION column.	Add "Front panel on model T-336A/URT-7".
		5th item in LOCATION column.	Change "Back of left" to "Back of right".
		5th item in LOCATION column.	Add "Front panel on model T-336A/URT-7".
6-1	5	9	Change "volatile cleaning solution (Federal Specification No. P-S-661a) to "dry cleaning solvent 140F type 2, SNSN G51-S-4718-10".
7-3	2d(1)	1	Change "figure 7-28" to "figures 7-28 and 7-28A".
7-7	2g	5	Change "figure 7-28" to "figures 7-28 and 7-28A".
7-11	Figure 7-7	Lower right hand corner.	Change "R410" to "R418".
7-14	Figure 7-11	To the right of R614.	Add, an arrow and the call-out C640.
7-17	Figure 7-14	Above R142	Add "R142 is physically located at the bottom of XV101 on model MD-163A/URT".

PAGE	PARA & LINE or FIG & LOCATION		ACTION
7-19	Figure 7-17	R117	Add "On model MD-163A/URT, R117 is physically located between pin 3 of XV104 and chassis".
7-22	Figure 7-22	Caption	Add "for model PP-773/URT".
7-23	4c(8)	8	Change "(see figure 7-22)" to "(see figures 7-22 and 7-22A)".
7-25	6a	2	Change "REPLACEMENT PARTS" to "REPLACEMENT PARTS FOR MODEL AM-638/URT".
7-31	Table 7-5	Designation symbol column.	Add "L401**" below "L401". Add "L402**" below "L402". Add "L403**" below "L403".
		At bottom of page.	Add "** See Table 7-5A".
7-33	Table 7-5	Designation symbol column.	Add "L615**" below "L615".
7-34	Table 7-5	Designation symbol column.	Add "L616**" below "L616". Add "L618**" below "L618". Add "T101**" below "T101".
		Bottom of page.	Add "** See Table 7-5A".
7-35	Table 7-5	Designation symbol column.	Add "T102**" below "T102". Add "T103**" below "T103".
		Bottom of page.	Add "** See Table 7-5A".
7-36	Table 7-5	Designation symbol column.	Add "**T401" below "T401".
		Designation symbol column.	Add "**T402" below "T402".
		Bottom of page.	Add "** See Table 7-5A".
7-37, 7-38	Figure 7-28	Schematic	Add resistor "R609 2200" between L605 and +300 V line. Add ".001" below "C632". Add, two parallel lines adjacent to coils L401A and L401B to indicate iron core.
		Title	Add "not applicable to T-336A/URT".

PAGE	PARA & LINE or FIG & LOCATION		ACTION
7-41, 7-42	Figure 7-30	On wiring diagram.	Change "R117" to "R117*".
		Below note.	Add "*On model MD-163A/URT, wire 152 is removed, and R117 is located at XV104 between pin 3 and chassis.
7-43, 7-44	Figure 7-31	Title	Add "not applicable to T-336A/URT-7".
8-3, 8-11, 8-13, 8-17, 8-21, 8-31, and 8-33	Footnote	Beginning with "*"	Delete.
8-15	Footnote	Beginning with "†".	Delete.
8-36	Table 8-3	Caption	Add "for model T-336/URT-7".
8-37, 8-38, and 8-39	Table 8-4	Caption	Add "for model T-336/URT-7".

On pages 8-2 through 8-33 make the following pen and ink additions or corrections.

Symbol Desig.	Standard Navy Stock Number	Name and Description	Locating Function
A503**		See Table 8-1A.	
A607**		See Table 8-1A.	
A608**		See Table 8-1A.	
A609**		See Table 8-1A.	
B601†	N17-B-21188-4040		
B601**		See Table 8-1A.	
C111	N16-C-19786-3791	CAPACITOR, FIXED ELECTROLYTIC: type No. C E 63 C250H; per spec. JAN-C-62.	Driver amplifier cathode bypass.
C113		Same as C111.	

PAGE	PARAGRAPH OR FIGURE	LINE OR LOCATION	ACTION
7-8	Figure 7-4		Add to notes "115 VAC between pins 8 and 11 on model AN/URT-7B".
7-27	6b	2	After "(See figure 7-26 or 7-26A)" add "or 7-26B".
8-41	Table 8-6		Add:
		Col. 1	RAQA
		Col. 2	Rauland-Borg
		Col. 3	3515 W. Addison Ave., Chicago, Ill.

On pages 8-2 through 8-33, make the following pen and ink additions:

Symbol Desig.	Standard Navy Stock Number	Name and Description	Locating Function
C195 ***		See Table 8-1B	
C619.1 ***		See Table 8-1B	
C642.1 ***		See Table 8-1B	
K403 ***		See Table 8-1B	
K404 ***		See Table 8-1B	
O601.1 ***		See Table 8-1B	
P404 ***		See Table 8-1B	
P405 ***		See Table 8-1B	
R151 ***		See Table 8-1B	
R195 ***		See Table 8-1B	
W303.1 ***		See Table 8-1B	
XV604.1 ***		See Table 8-1B	
XV605.1 ***		See Table 8-1B	
XV606.1 ***		See Table 8-1B	
A403-1 *** to A403-4 ***		See Table 8-7	
A609 ***		See Table 8-7	
C619.1-D ***		See Table 8-7	
C642.1-F ***		See Table 8-7	
C646 ***		See Table 8-7	

*** Used on Radio Transmitter T-336B/URT

Symbol Desig.	Standard Navy Stock Number	Name and Description	Locating Function
C647 ***		See Table 8-7	
E108 ***		See Table 8-7	
E109 ***		See Table 8-7	
E110 ***		See Table 8-7	
E111 ***		See Table 8-7	
E403 ***		See Table 8-7	
H103 ***		See Table 8-7	
H105 ***		See Table 8-7	
L602 ***		See Table 8-7	
L604 ***		See Table 8-7	
L607 ***		See Table 8-7	
L609 ***		See Table 8-7	
L610 *** to L616 ***		See Table 8-7	
L618 ***		See Table 8-7	
L621 ***		See Table 8-7	
A501 ***		See Table 8-8	
A503 ***		See Table 8-8	
A606 ***		See Table 8-8	
A607 ***		See Table 8-8	
E105 ***		See Table 8-8	
H602-1 *** to H602-12 ***		See Table 8-8	
H603-1 *** to H603-16 ***		See Table 8-8	
H604-1 *** to H604-28		See Table 8-8	

*** Used on Radio Transmitter T-336B/URT

Instructions for inserting revision pages and making the pen and ink corrections contained in CORRECTION T-1 to correct INSTRUCTION BOOK for RADIO TRANSMITTING SET AN/URT-7 (NAVSHIPS 91684) to incorporate the "A" model.

Remove title page and insert new title page.

Page 2-7, 2-8; remove and insert pages 2-7, 2-8, and 2-8A.

Page 4-1, 4-2; remove and insert pages 4-1, 4-2, and 4-2A.

Page 7-22A; insert after page 7-22.

Page 7-27, 7-28; remove and insert pages 7-27 and 7-28.

Pages 7-36A, B, C, and D; insert after page 7-36.

Page 7-38A, 7-38B; insert after page 7-37, 7-38.

Page 7-44A, 7-44B; insert after page 7-43, 7-44.

Page 8-1, 8-2; remove and replace with pages 8-1, 8-2, 8-2A and 8-2B.

Page 8-35, 8-36; remove and replace with page 8-35, 8-36.

Page 8-39, 8-40; remove and replace with pages 8-39, 8-40, 8-40A, 8-40B, 8-40C, and 8-40D.

Make additions and corrections as shown in CORRECTION T-1.

NAVSHIPS 91684

INSTRUCTION BOOK

for

RADIO TRANSMITTING SETS AN/URT-7, 7A, 7B

FEDERAL TELEPHONE AND RADIO CORPORATION
CLIFTON, NEW JERSEY
and
RAULAND-BORG CORPORATION
CHICAGO, ILLINOIS

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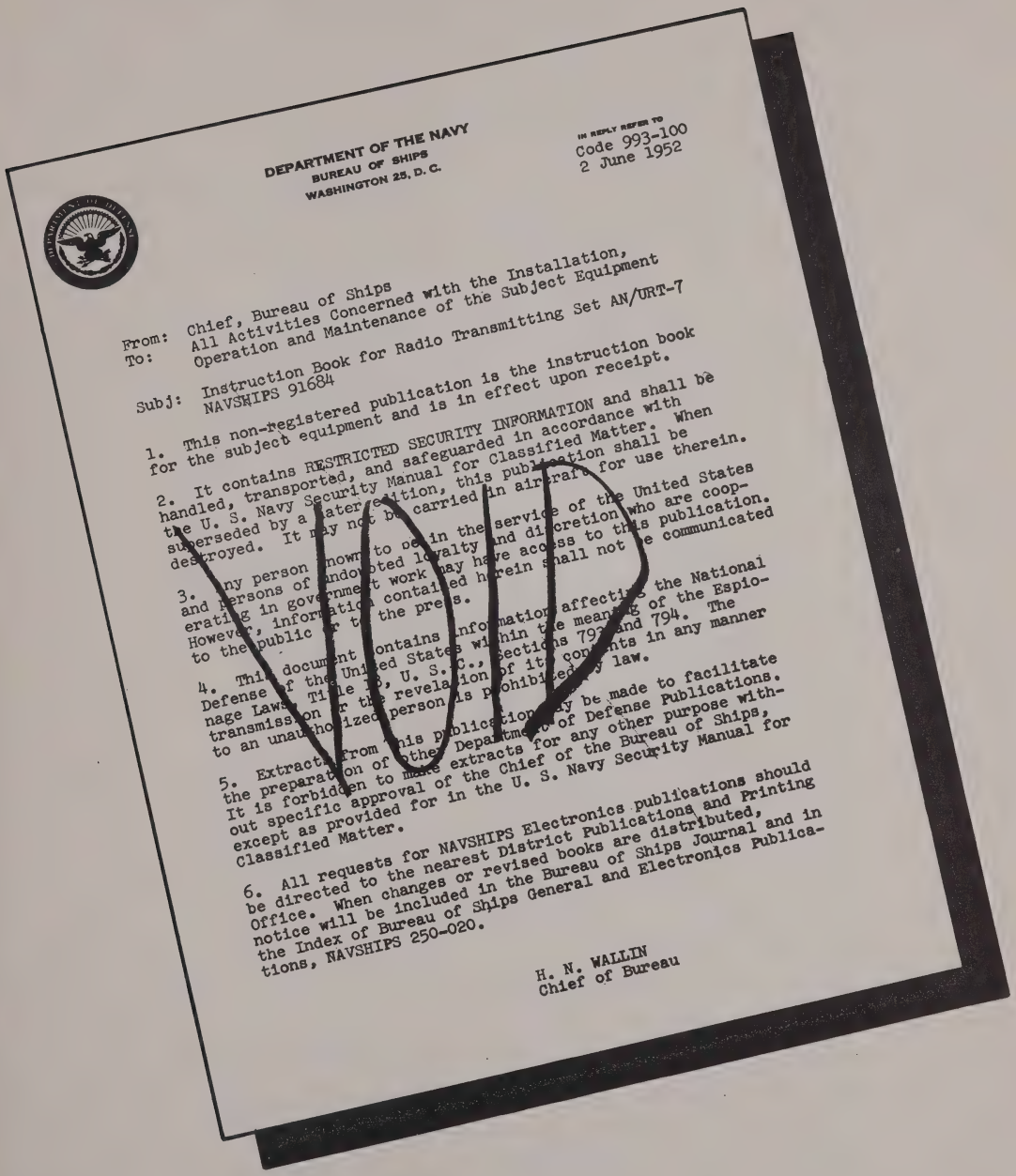

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
2 June 1952

From: Chief, Bureau of Ships
To: All Activities Concerned With the Installation, Operation and Maintenance of the Subject Equipment

Subj: Instruction Book for Radio Transmitting Set AN/URT-7

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H. N. WALLIN
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

Symbol Desig.	Standard Navy Stock Number	Name and Description	Locating Function
C118**		See Table 8-1A.	
C128		Same as C111.	
C615**		Same as C606.	R-F amplifier output coupling.
C618	N16-C-18660-1582		
C619D**		See Table 8-1A.	
C642D**		See Table 8-1A.	
C645	N16-T-98076-2401		
C645A	N16-R-94402-1489		
C646	Delete stock number		
E104-1 to E104-2		Not used on model T-336 A/ URT-7.	
E107**		See Table 8-1A.	
E108	Shop Manufacture	In line 2, change "9 pairs brass" to "8 pairs brass".	
E109	Shop Manufacture	In line 2, change "11 pairs brass" to "13 pairs brass".	
E110		In line 2, change "10 pairs brass" to "12 pairs brass".	
E409-1** to E409-2**		See Table 8-1A.	
E608	N16-D-46552-3426		
E612-1** to E612-2**		See Table 8-1A.	
E615-1** to E615-2**		See Table 8-1A.	
E616-1** to E616-2**		See Table 8-1A.	
E617-1** to E617-2**		See Table 8-1A.	

Symbol Desig.	Standard Navy Stock Number	Name and Description	Locating Function
E618-1** to E618-3**		See Table 8-1A.	
E619**		See Table 8-1A.	
E620-1** to E620-2**		See Table 8-1A.	
E621**		See Table 8-1A.	
E622**		See Table 8-1A.	
H101	N16-T-751512-134		
H102	GM41-W-2449-2		
H108**		See Table 8-1A.	
J101	N17-C-73330-5001		
L602	N16-C-76320-5962		
L604	N16-C-76233-5005		
L610	Delete stock number		
L613	Delete stock number		
L614	Delete stock number		
L615	N16-C-71700-3920		
L615**		See Table 8-1A.	
L616**		See Table 8-1A.	
L618	N16-C-71598-6575		
L618**		See Table 8-1A.	
O608-1** to O608-2**		See Table 8-1A.	
P403	Delete stock number		
R104**		See Table 8-1A.	
R114**		See Table 8-1A.	
R139**		See Table 8-1A.	
R147	N16-R-50552-135		
R190**		See Table 8-1A.	

Symbol Desig.	Standard Navy Stock Number	Name and Description	Locating Function
R613	N16-R-50515-941		
W302	N17-C-48890-3151		
XF403**		See Table 8-1A.	
XF405**		See Table 8-1A.	
XI401A	N17-L-76854-4200		
XI401B	N17-L-250627-560		
XI402B	N17-L-250305-452		
XV102	N16-S-64063-6713		
XV105	Delete stock number		

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GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communciations. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for effecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObsr-52311 Date of Contract, 27 June 1951

Serial Number of equipment .....

Date of acceptance by the Navy .....

Date of delivery to contract destination .....

Date of completion of installation .....

Date placed in service .....

Blank spaces on this page shall be filled in at time of installation.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised). The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

Procedure:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water cooling systems in gas engines, generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual* or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

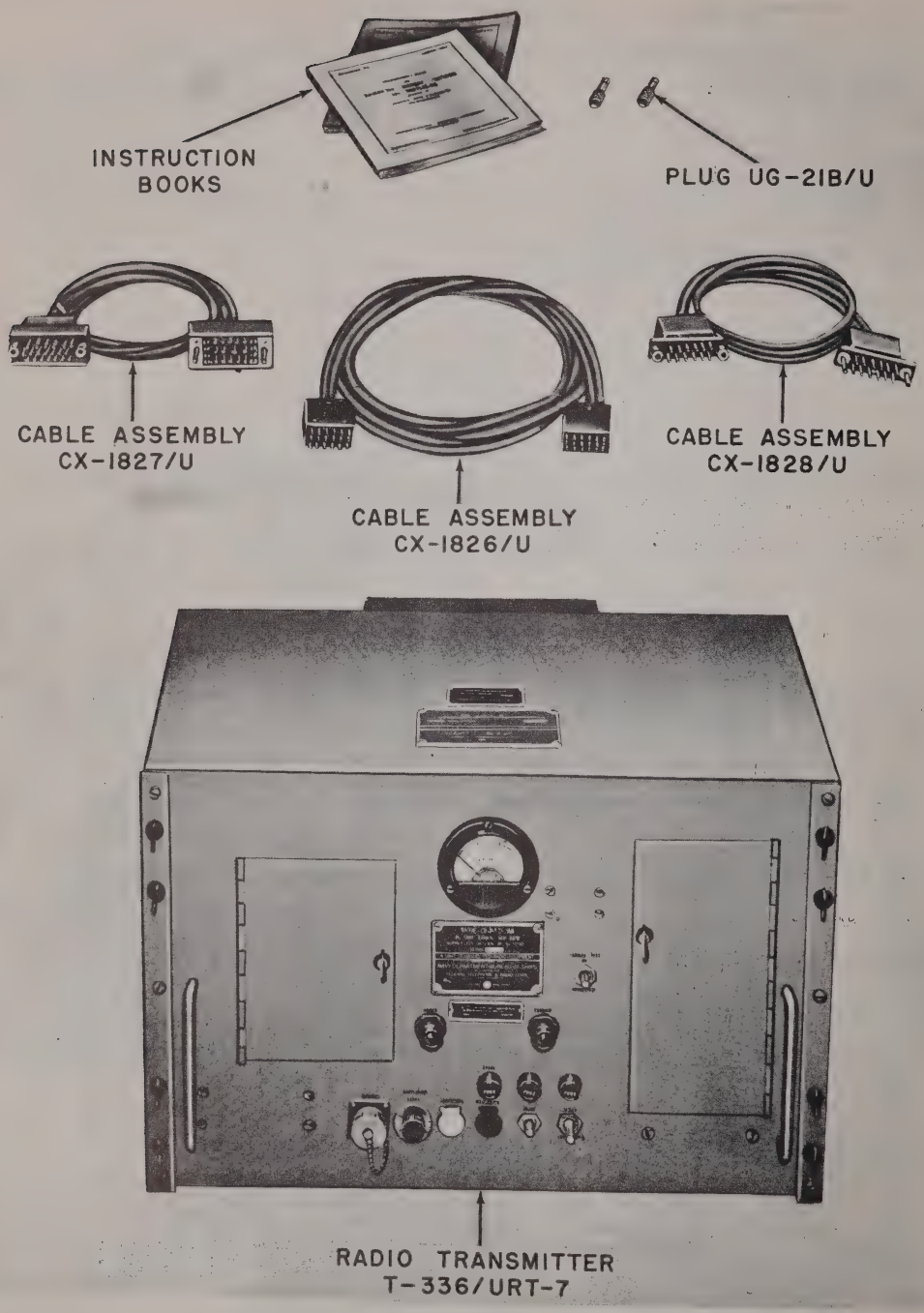


Figure 1–1. Radio Transmitting Set AN/URT-7

SECTION 1
GENERAL DESCRIPTION

1. INTRODUCTION.

This instruction book contains information concerning the theory, operation, installation, maintenance, and repair of the Radio Transmitting Set AN/URT-7.

2. PURPOSE OF EQUIPMENT.

The major components of Radio Transmitting Set AN/URT-7 consist of Radio Transmitter T-336/URT-7 and Cable Assemblies CX-1826/U, CX-1827/U, and CX-1828/U; see figure 1–1. The equipment is employed for radiotelephone and modulated-continuous-wave (MCW) communications at frequencies from 115 to 156 megacycles per second. These frequencies limit the reliable range of the equipment to approximately "line-of-sight" transmission. The equipment can be installed on ships, submarines, and at shore stations.

The Radio Transmitter operates from a 115-volt or 230-volt, 50/60-cps power source and delivers 30 watts output. The equipment may be mounted on a table or may be removed from its cabinet and mounted in a standard 19-inch relay rack. If desired, remote control operation may be accomplished from a standard Remote Radiophone Unit Navy Type -23500, or equivalent. Alternatively, limited control of the Radio Transmitter from a remote location may be obtained with Transmitter Control Navy Type -23555.

3. DESCRIPTION OF UNITS.

a. RADIO TRANSMITTER T-336/URT-7.—The Radio Transmitter, shown in figure 1–2, contains all the equipment required for radio transmission by voice or telegraph, except for such accessories as handset, key, and antenna. The units comprising the transmitter are Power Supply PP-773/URT, Radio Modulator MD-163/URT, Amplifier-Oscillator AM-638/URT, Electrical Equipment Cabinet CY-1126/URT, and a terminal box. The Power Supply occupies the center of a drawer-type chassis attached to the front panel. The Radio Modulator and Amplifier-Oscillator units are removable assemblies mounted, respectively, to the left and right of the power supply components. Small doors, one on either side of the front panel, provide access to the Radio Modulator and Amplifier-Oscillator operating controls.

Connections between the Power Supply and the other two units are made through plugs mounted on the rear of the Power Supply front panel. These plugs engage receptacles mounted on the lower front of the Radio Modulator and Amplifier-Oscillator chassis. The terminal box, which is attached to the cabinet (or directly to the back of the Power Supply chassis when the cabinet is not used), contains all terminals necessary for external connections.

(1) POWER SUPPLY PP-773/URT.—The Power Supply chassis (figure 1–3) contains the power transformers, high-voltage rectifier tubes, low-voltage selenium rectifiers, filters, and bleeder resistors needed to produce all voltages required for operation. Control relays are also located on this chassis. The meter mounted on the front panel is used to monitor various currents and voltages in the entire Radio Transmitter; the switching circuit is located on the Power Supply chassis. Also mounted on the front panel are the power and control switches, indicators, and fuses, as well as microphone and handset jacks.

(2) RADIO MODULATOR MD-163/URT.—The Radio Modulator unit (figure 1–4) contains the audio transformers, tubes, and circuits required to effect voice or MCW modulation of the r-f carrier. The conventional speech amplifying and modulating circuits are supplemented by special circuits to provide expander, AVC, and clipper-filter action, all of which considerably increase the average carrier sideband power under voice-modulated operating conditions. A 1,000-cycle oscillator is included for MCW operation.

The modulator tubes are located toward the rear of the unit, while the speech amplifiers and the other smaller tubes are mounted on a shelf near the top and extending to the front panel. The nonoperating controls and switches associated with the modulator circuits are also grouped on this shelf. Most of the larger and heavier components (transformers, filter, etc.) are grouped at the bottom of the chassis, with the space between them and the small tubes at the top occupied by terminal boards upon which are mounted the smaller circuit components (capacitors, resistors, etc.). Mounted on the front panel, in addition to the operating controls, are an r-f alignment tool and an Allen wrench for the control-knob setscrews; these items are not visible through the panel door when the Radio Modulator is mounted on the Power Supply chassis. A tube puller for the type 4X150A r-f tubes is clip-mounted immediately behind the small receiving-type tubes.

(3) AMPLIFIER-OSCILLATOR AM-638/URT.—The Amplifier-Oscillator unit (figure 1–5) includes all the electrical components required for generation of the r-f carrier. The master oscillator is crystal-controlled and multiplied six times to produce output

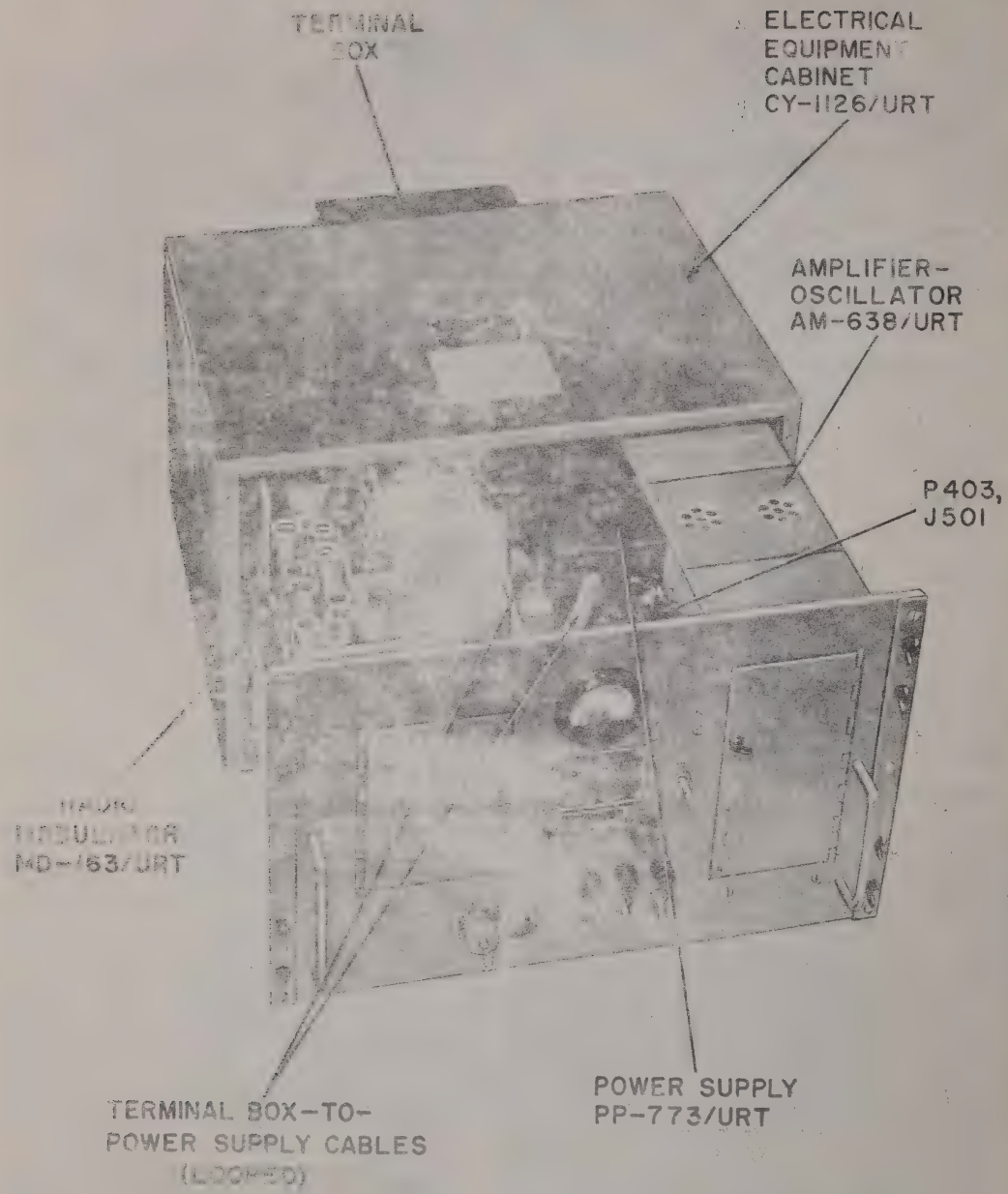


Figure 1–2. Radio Transmitter [illegible]36/URT-7, Partly Removed from Cabinet

frequencies of 115 to 156 megacycles per second. Mountings for four crystals are provided by a crystal-selector switch, permitting rapid selection of any one of four frequencies. Under emergency conditions, the oscillator circuit may be operated without using a crystal, with some loss in frequency stability.

The rear portion of the Amplifier-Oscillator is occupied by a blower, which provides forced-air ventilation. The remainder of the unit is divided into three sections by two horizontal shelves spaced above the chassis base. The oscillator and frequency-multiplier stages are mounted on the base, or lower shelf, along with the ganged tuning capacitor associated with those stages. The power-amplifier grid-circuit components and grid-tuning capacitor are located in the center compartment between the intermediate and top shelves, while the power-amplifier tubes and plate-circuit components and tuning capacitor are mounted on the top shelf. The front panel mounts the tuning controls and indicators, as well as the crystal switch. A small access panel permits installation of crystals from the front of the unit. The top, sides, and bottom of the Amplifier-Oscillator are completely enclosed by removable cover plates, which provide r-f shielding.

(4) ELECTRICAL EQUIPMENT CABINET CY-1126/URT.—The cabinet, shown in figure 1–2, houses the drawer-type chassis and provides facilities for mounting the equipment and for accommodating external connections. Two slotted guides are mounted in the bottom of the cabinet to permit easy removal and insertion of the chassis. When the transmitter installation utilizes the cabinet, the terminal box is mounted on the outside. For flexibility in mounting, the cabinet is designed to permit attachment of the terminal box in any one of three positions: on the back or on either of the two sides. Two removable louvered plates are used to cover the unused cabinet openings.

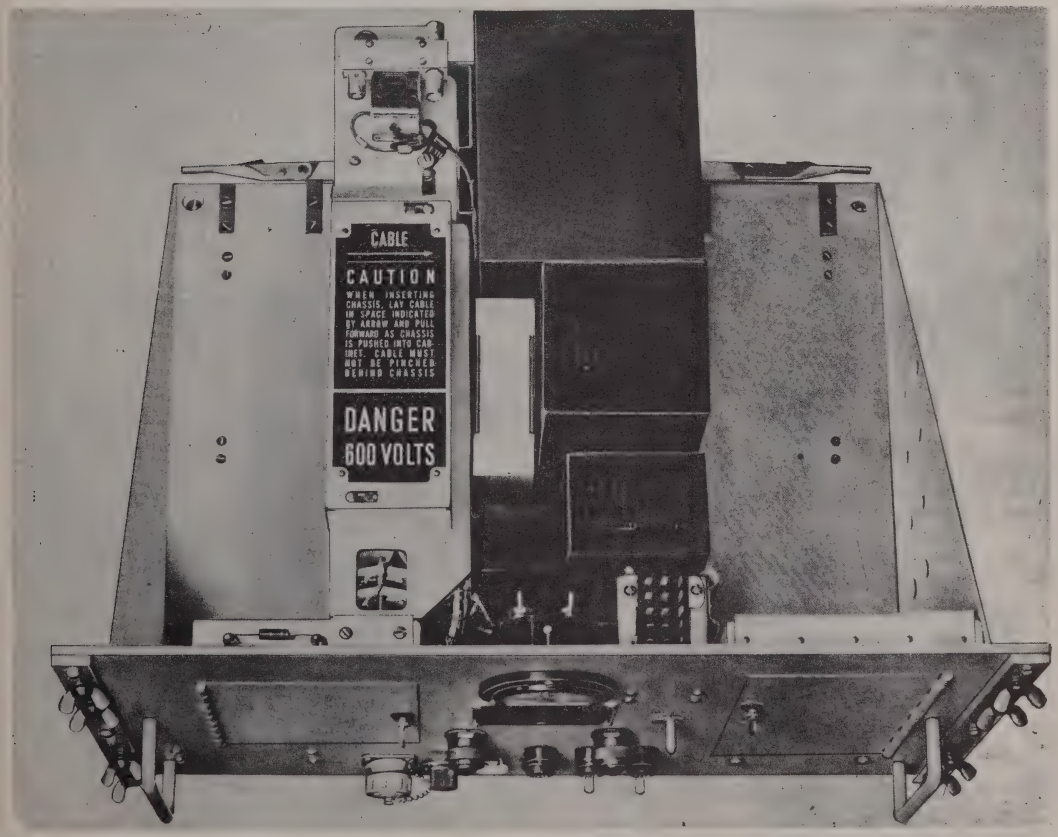

CABLE
CAUTION
WHEN INSERTING CHASSIS, LAY CABLE IN SPACE INDICATED BY ARROW AND PULL FORWARD AS CHASSIS IS PUSHED INTO CABINET. CABLE MUST NOT BE PINCHED BEHIND CHASSIS
DANGER
600 VOLTS

Figure 1–3. Power Supply PP-773/URT

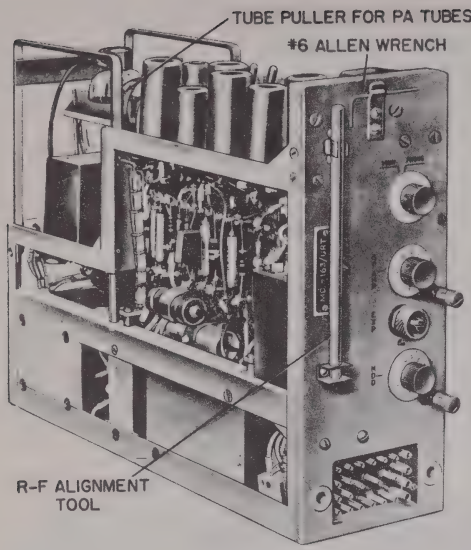


Figure 1–4. Radio Modulator MD-163/URT

(5) TERMINAL BOX.—The terminal box, shown mounted on the rear of the cabinet in figure 1–2, provides facilities for making all external connections to the Radio Transmitter, except for accessories (handset, microphone, etc.) connected to front-panel receptacles. It contains two terminal boards, a noise-suppression filter, and two coaxial receptacles for the antenna and receiver cables. As previously stated, the terminal box is mounted on the cabinet when the Radio Transmitter installation utilizes that enclosure, or at the rear of the Power Supply when relay-rack mounting is employed.

b. TEST CABLES.—The three cable assemblies shown in figure 1–1 are supplied so that the Radio Transmitter may be operated with its component units physically disassembled. Operation of this type is often necessary when testing or repairing the equipment in order to gain access to circuits or components not readily available when the transmitter is completely assembled. Cable Assembly CX-1826/U is used to connect the Power Supply to the terminal box (when mounted on the cabinet). Cable Assembly CX-1827/U is employed between the Power Supply and the Radio Modulator, and Cable Assembly CX-1828/U connects the Power Supply to the Amplifier-Oscillator unit.

4. REFERENCE DATA.

a. NOMENCLATURE.—Transmitting Set, Radio AN/URT-7.

b. CONTRACT NUMBER AND DATE.—NObsr-52311, 27 June 1951.

c. COGNIZANT NAVAL INSPECTOR.—Assistant Inspector of Naval Material, 167 Prospect Street, Passaic, N. J.

d. CONTRACTOR.—Federal Telephone and Radio Corporation, Clifton, N. J.

e. NUMBER OF BOXES.—Two.

f. CUBICAL CONTENTS.—See tables 1–1 and 1–3.

g. WEIGHT.—See tables 1–1 and 1–3.

h. FREQUENCY RANGE.—115 to 156 mc.

i. TYPE OF FREQUENCY CONTROL.—Crystal.

j. TYPES OF EMISSION AND MODULATION CAPABILITY.—A-2 (MCW) 100 percent, A-3 (Phone) 100 percent.

k. NOMINAL CARRIER OUTPUT.—30 watts.

l. CRYSTALS.—Type CR-24/U.

m. FREQUENCY STABILITY.—±0.007 percent under any conditions or combination of conditions.

n. IMPEDANCE.

(1) Microphone input: 600 ohms.

(2) Antenna output: 50 ohms.

o. AUDIO INPUT VOLTAGE.— –25 db to +5 db from a 0.006-watt reference level (0.1 to 3.4 volts).

p. AUDIO-FREQUENCY RESPONSE CHARACTERISTIC.—Flat within ±3 db, from a 1,000-cps reference level, from 300 to 3,500 cps.

q. AUDIO-FREQUENCY FILTER CHARACTERISTIC.—Flat within ±2 db from a 1,000-cps reference level and –50 db at 5,000 cps and over.

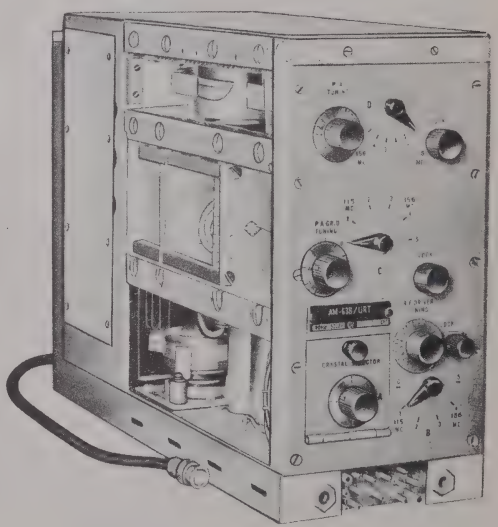


Figure 1–5. Amplifier-Oscillator AM-638/URT

r. INPUT TO CLIPPING STAGE.—Normally held 20 ±5 db above the clipping level by action of the AVC circuit for variations in the input of −25 to +5 db from 0.006-watt reference level.

s. POWER SUPPLY.

115/230 volts, 50 to 60 cps, ac, single phase.

Power factor: 0.85.

Input power: 750 watts.

Maximum permissible line-voltage variation: ±10 percent.

Maximum permissible line-frequency variation: ±5 percent.

t. HEAT DISSIPATION.—700 watts.

TABLE 1—1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS*			VOLUME*	WEIGHT*
			HEIGHT	WIDTH	DEPTH		
1	Radio Transmitter, includes	T-336/URT-7	13-23/32	19†	16-1/2†	2.75	146
	1 Amplifier-Oscillator	AM-638/URT	9-31/32	5	14-1/2	0.42	
	1 Electrical Equipment Cabinet	CY-1126/URT	13-23/32	19†	14-13/16†	2.5	
	1 Power Supply	PP-773/URT	12-7/32	19	16-1/4	2.2	
	1 Radio Modulator	MD-163/URT	9-31/32	4	14-3/8	0.33	
1	Cable Assembly	CX-1826/U					1-3/4
1	Cable Assembly	CX-1827/U					1-1/2
1	Cable Assembly	CX-1828/U					1
2	Connector, Plug	UG-21B/U	1-3/4	13/16	13/16		0.03
1	Maintenance Parts Kit		12-1/8	25-1/8	16-3/8	2.9	85
2	Instruction Book	NAVSHIPS 91684	11-1/4	8-11/16	1/2	0.03	1-1/4

*Dimensions are in inches, volume in cubic feet, and weight in pounds.
†Add 2 inches to width or depth, dependent upon location of terminal box.

TABLE 1—2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
Remote Radiophone Unit	-23500	Remote operation	Per 16R28(RE)
Hand Telephone Assembly or Chestset	-51081 or equivalent -51090 or equivalent	Speaking and listening Speaking and listening	Per RE8944A —
Antenna Assembly	-66095	Transmiting and receiving	—
Interconnecting Cables	—	—	—
Crystal Unit	CR-24/U	Frequency control of transmitter	—

TABLE 1–3. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVER-ALL DIMENSIONS*			VOLUME*	WEIGHT*
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Transmitting Set	AN/URT-7	19⅛	25⅞	22⅜	6.4	186
2	Equipment Spares		14⅜	29⅛	18⅞	4.6	115

*Dimensions are in inches, volume in cubic feet, and weight in pounds.

TABLE 1–4. ELECTRON TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED								Total No. of Tubes
	3B28	4X150A	6AL5	6AT6	6BA6	12AT7	12AU7	807	
Radio Transmitter T-336/URT-7:									
Amplifier-Oscillator AM-638/URT		3				3			6
Radio Modulator MD-163/URT			2	1	1		4	2	10
Power Supply PP-773/URT	2								2
Total Number of Each Type	2	3	2	1	1	3	4	2	18

SECTION 2
THEORY OF OPERATION

1. GENERAL CIRCUIT DESCRIPTION.

Radio Transmitter T-336/URT-7 comprises a radio-frequency unit (Amplifier-Oscillator AM-638/URT), a modulator unit (Radio Modulator MD-163/URT), and a power supply unit (Power Supply PP-773/URT). A functional block diagram of the entire transmitter, showing the various stages in each unit, appears in figure 2–1; the complete schematic diagram is shown in figure 7–28. The function of the Amplifier-Oscillator is to generate the r-f carrier output at any chosen frequency in the range of 115 to 156 megacycles, while the Radio Modulator impresses voice or tone modulation upon the carrier so generated. In addition, special circuits are incorporated in the Radio Modulator to improve the overall modulation efficiency. The Power Supply operates from a 115- or 230-volt, 50-to-60 cycle source and provides all required operating voltages.

a. AMPLIFIER-OSCILLATOR AM-638/URT. — Crystal oscillator V601 generates an output between 19.17 and 26 megacycles. This signal is doubled in frequency (38.33 to 52 megacycles) by doubler V602, and then amplified by amplifier V603. The first three stages utilize type 12AT7 twin triodes. Tripler V604 (4X150A tetrode) multiplies the signal to a frequency between 115 and 156 megacycles, which is then amplified by the push-pull 4X150A power amplifier stage (V605 and V606). A tuned output filter minimizes the radiation of harmonics. The r-f output reaches the antenna via an antenna relay mounted on the Power Supply chassis; the relay is provided to switch the antenna between the Radio Transmitter and the receiver being used, during periods of transmission and reception, respectively.

b. RADIO MODULATOR MD-163/URT.—The Radio Modulator includes a basic audio channel which amplifies speech or MCW tone to a level sufficient for 100-percent modulation of the r-f carrier output. Also incorporated are AVC, clipper, and filter circuits for increasing the average modulation percentage, as well as an expander circuit to minimize background noise during voice modulation. An audio oscillator provides a 1,000-cycle modulation tone for MCW operation.

(1) BASIC AUDIO CHANNEL.–Figure 2–1 can be used to visualize the basic audio circuits if switches S102, S103, and S104 are assumed to be in their OFF positions. The speech input is amplified by the 6BA6 first audio amplifier, V101. It is further amplified by V104, a 12AU7 twin triode functioning as the second and third audio amplifiers. Output from V104B drives the push-pull 807 modulator stage (V105 and V106), which modulates the d-c input to the power amplifier. When switch S101 is in the MCW position, for operation in that mode, the audio output from MCW oscillator V109 (triode section of a 6AT6 duo-diode-triode) is applied directly to the input of the third audio amplifier, since the oscillator output is considerably higher than the microphone output level.

(2) CLIPPER-FILTER AND AVC CIRCUITS. —When switches S102 and S103 are placed ON, the clipper, filter, and AVC circuits are connected into the audio channel. Instead of being applied directly to the second audio amplifier, the output from first audio amplifier V101 is increased in amplitude by AVC amplifier V102A (one half of a 12AU7) and then fed to the 6AL5 clipper, V103. That stage clips the audio at a preset level. The low-pass filter (Z101) then attenuates all the high-frequency components above 3,500 cps which are present in the clipped audio signal to prevent modulation of the carrier by those frequencies. The average modulation level is thereby increased and the effect of voice-level fluctuations is minimized.

The clipper circuit is aided by AVC action provided by the AVC rectifier, V102B (a diode-connected section of a 12AU7 twin triode). V102B rectifies a portion of the output from AVC amplifier V102A; the rectified signal is applied as an AVC bias to the first audio stage. The AVC action helps maintain an audio level which is suitable for continuously efficient clipping by V103.

(3) VOLUME EXPANSION. — A volume-expander circuit is provided to eliminate transmission of extraneous background noise when pauses in speech occur during transmission. The expander utilizes an electronic control circuit which disables the third audio amplifier when the microphone input drops below a preset level; switch S104 must be ON. The circuit consists of a 12AU7 monostable multivibrator (V107), rectifier V108A (one diode section of a 6AL5), and a clamping circuit which utilizes the diode sections of V109. In the absence of microphone audio input, a bias voltage keeps V104B cut off. When the audio input triggers the multivibrator, the output from that stage is rectified by V108A and overcomes the bias on V104B, allowing the amplified audio to reach the modulator tubes.

(4) MODULATION INDICATOR.—A portion of the output from the modulator tubes is rectified for application to the Radio Transmitter meter cir-

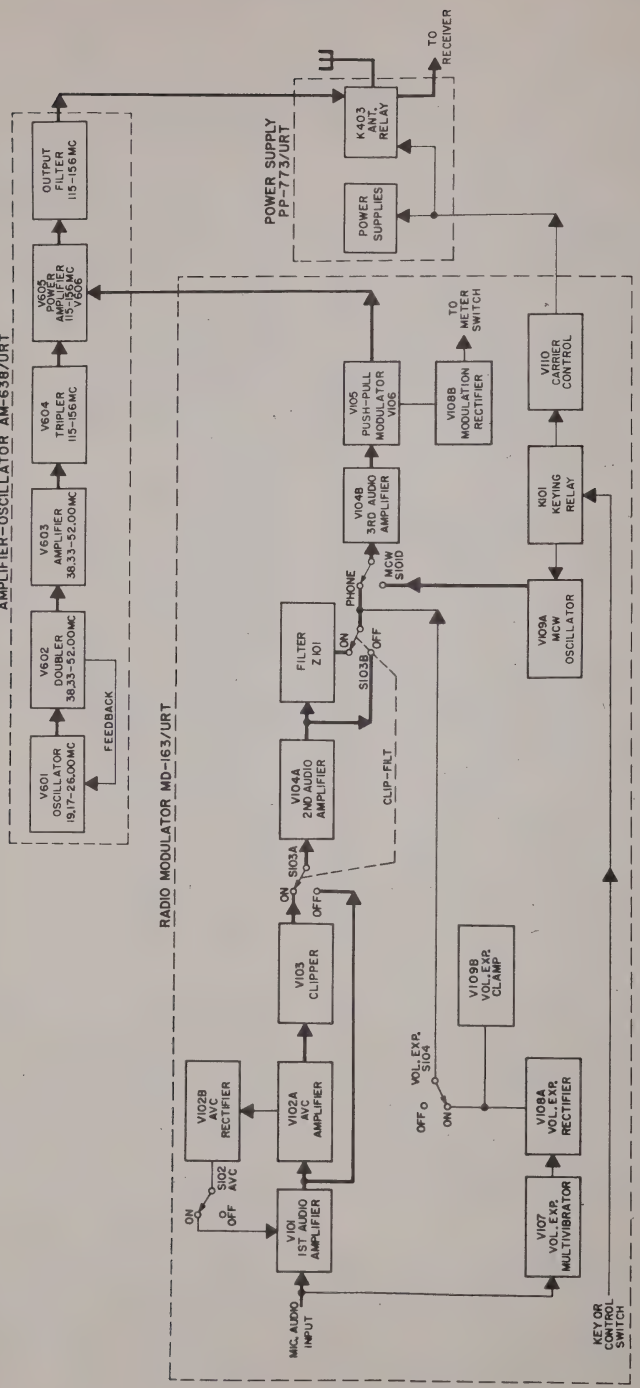


Figure 2–1. Radio Transmitter T-336/URT-7, Functional Block Diagram

cuit. One half of a 6AL5 dual diode (V108B) is utilized as the rectifier, so that the relative modulating audio voltage can be monitored.

(5) CARRIER CONTROL AND ANTENNA CHANGE-OVER.—The local or remote carrier-control switch, the microphone or handset press-to-talk switch, or the key (when MCW operation is employed) energizes keying relay K101. In turn, K101 is connected to V110, the 12AU7 carrier control tube. This stage controls relay circuits which energize portions of the Power Supply to allow generation of the modulated carrier and transfer the antenna from the receiver to the output of the transmitter r-f circuits.

(6) AUDIO MONITORING CIRCUIT.—Audio signal from a receiver associated with the Radio Transmitter is brought in to a winding on the Radio Modulator input transformer. From the primary winding it is fed into the earpiece of the operator's telephone handset. Besides receiver monitoring, this arrangement also provides operating side-tone. Relay operation disconnects the receiver audio when the carrier is on.

c. POWER SUPPLY PP-773/URT.

(1) POWER SUPPLIES.—The Power Supply includes conventional transformer, tube rectifier, and filter circuits to develop high-voltage plate and screen supplies. In addition, there is a bias circuit using a transformer, selenium rectifier, and filter circuit to produce a negative 42-volt supply. Also included is a selenium-rectified 12-volt d-c supply which is used to operate pilot lamps and may be used as a source of microphone voltage for remote-control operation.

(2) METERING CIRCUIT.—A single front-panel meter, used in conjunction with a selector switch (both located on the Power Supply chassis), provides a means of measuring various grid and plate currents, as well as relative power output, AVC current, modulation level, volume expansion, etc.

2. CIRCUIT ANALYSIS.

a. AMPLIFIER-OSCILLATOR AM-638/URT.

(1) OSCILLATOR.—The r-f oscillator utilizes V601, a 12AT7 twin triode, in a crystal-controlled circuit which obtains feedback voltage from doubler V602; see figure 2–3. To explain the operation of the oscillator, an equivalent but simplified circut has been illustrated in figure 2–2. L and C form a tank circuit in the plate circuit of V1; it is tuned to the resonant frequency of the crystal, Y1. Oscillations appearing at the plate of V1 are coupled to the grid of V2 through C1. V2 acts as a cathode follower, its output cathode voltage being in phase with the V1 plate voltage oscillations. Crystal Y1, oscillating in a series-resonant mode, transmits the voltage at the cathode of V2 to the cathode of V1. In turn, V1 now acts as a grounded-grid amplifier, and reinforces the oscillations at its plate. Thus the positive feedback necessary to sustain oscillation is obtained.

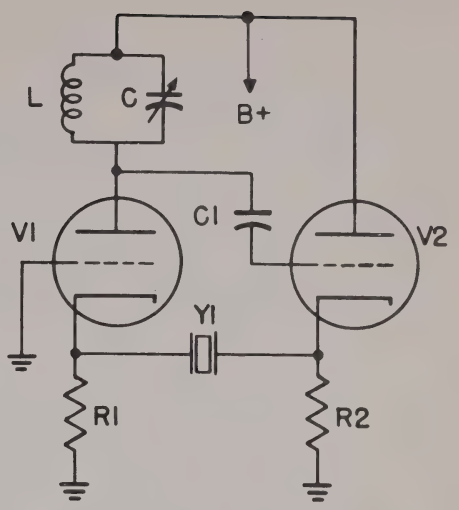


Figure 2–2. R-F Oscillator, Simplified Equivalent Circuit

The actual circuit is shown in figure 2–3. The stage corresponding to V1 of the simplified circuit is a 12AT7 dual triode, V601, both sections of which are connected in parallel. Since V601 effectively functions as a single triode, it is so shown in figure 2–3. Keyed plate voltage is supplied through decoupling network C601-R603-C630 and r-f choke L601. The tank circuit is shunt-fed through C602 and is comprised of C605A, C604, and L602. It is tunable through the frequency range of 19.17 to 26 megacycles by C605A.

The necessary cathode impedance corresponding to R1 of figure 2–2 is R602.

The second stage, corresponding to V2 of figure 2–2, is doubler V602, another 12AT7 twin triode with both sections connected in parallel; V602 is also shown as one triode, since it functions as a single stage. The doubler plate-tank circuit tunes a frequency range twice that of the oscillator stage, i.e. 38.33 to 52 megacycles. The tank-circuit impedance at the crystal oscillator frequency is therefore very low, resulting effectively in grounded-plate operation of V602 for the oscillator frequency, as indicated in figure 2–2. The cathode-follower action is obtained by the connection of R606 which corresponds to R2 of figure 2–2, and the output voltage is fed back through the selected crystal to the cathodes of V601. Thus V601 and V602 oscillate at the crystal frequency when C605A tunes the oscillator plate-tank circuit to the crystal frequency. C605A is gang-tuned with the other sections of C605. C604 is the plate padder and, with L602, is varied to make the final tuning-range adjustments for proper tracking

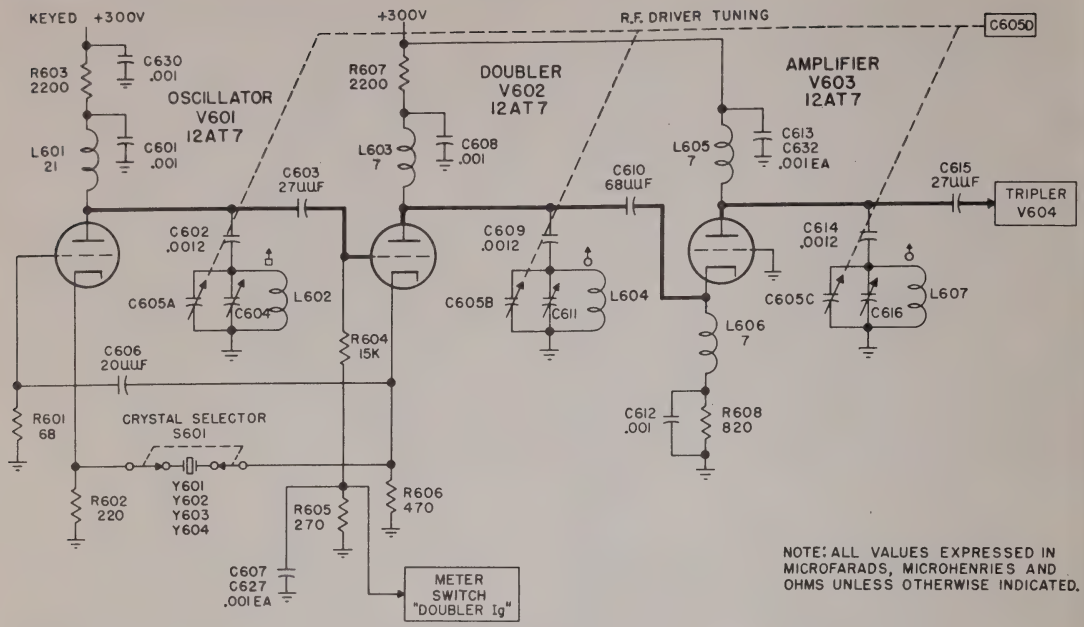


Figure 2–3. Oscillator, Doubler, and Amplifier Stages, Simplified Schematic Diagram

of the ganged control. Coupling capacitor C603, corresponding to C1 of figure 2–2, couples the output of the oscillator into the doubler. To prevent oscillations at spurious frequencies, R601 is inserted in the grounded-grid circuit of V601 and a small amount of degenerative feedback is coupled from the cathode of V602 to the grid of V601 through C606.

(2) DOUBLER.—The doubler, V602, serves as part of the oscillating circuit and also as a frequency multiplier; see figure 2–3 and subparagraph (1), above. The signal voltage developed in the oscillator circuit is applied to the grid of V602 through coupling capacitor C603.

Operating bias for the stage is developed across grid resistor R604 by the discharge of C603 on the negative swing of the input signal, while protective bias is developed across the cathode resistor, R606. The grid is returned to ground through R604 and R605, the latter serving as the shunt for switch position 1 (DOUBLER I_g) of the meter. Capacitors C607 and C627 bypass the meter circuit for rf.

Plate voltage is supplied through decoupling network R607-C608 and the r-f choke, L603. The plate-tank circuit, consisting of C605B, C611, and L604, is shunt-fed through C609. The tank circuit is tuned to the second harmonic of the input frequency. The output, coupled to the succeeding amplifier stage through C610, has a frequency range of 38.33 to 52 megacycles.

(3) AMPLIFIER.—A paralleled 12AT7 twin triode (V603) is used as a Class C grounded-grid amplifier to provide sufficient drive for the tripler stage. V603 is shown in figure 2–3 as a single triode, reflecting the manner in which it actually functions. The input signal is coupled into the cathode from the plate of the doubler. L606 presents the necessary impedance for developing the signal voltage. The plate-tank circuit, which tunes the same frequency range as the doubler, 38.33 to 52 megacycles, is shunt-fed through C614. C605C, the third section of the four-section capacitor, is the main tuning control. Alignment adjustments are made with L607 and C616, both of which are variable, to insure proper tracking of the ganged control. The output of the amplifier is coupled into the grid of the tripler through C615. Cathode bias for the amplifier is provided by R608 and C612. Plate voltage is supplied through r-f choke L605; capacitors C613 and C632 (connected in parallel) bypass the 300-volt supply for rf.

(4) TRIPLER.—A 4X150A tetrode amplifier tube is used as a frequency tripler and appears in the simplified schematic of figure 2–4. Protective bias of –42 volts is applied to the grid via the meter-swtching circuit in the Power Supply; the meter measures grid current when its associated switch is in the TRIPLER I_g position. Additional bias for Class C operation is developed across R610 by grid-

current flow resulting from the input signal voltage. The meter circuit is bypassed by capacitors C617 and C624.

Plate voltage is supplied through r-f filter L608-C618-C625 from the meter circuit in the Power Supply. A meter shunt used in measuring the tripler plate current is incorporated in the meter circuit; the meter indicates the relative value of plate current when its switch is set to TRIPLER I_p.

The plate-tank circuit, consisting of L609, L610, C621, and C605D (the fourth section of ganged capacitor C605), is shunt-fed through C620. This tank tunes a range of 115 to 156 megacycles, which is three times the input frequency. Alignment adjustments are made with L609 and C621 to insure proper tracking of C605D with the other sections of that ganged-capacitor assembly. The output of the tripler stage is link-coupled to the power amplifier grid circuit by L611 and L612; those two link coils are connected by coaxial cable W601 and connectors J602 and J603.

Resistors R611 and R612, in series, and R613 form a voltage divider connected across the keyed 300-volt line. Screen-grid voltage for V604 is tapped from the junction of R612 and R613 and the screen is bypassed to ground by C619.

C619, shown in figure 7–21, is a parallel-plate capacitor. One side is a spring-fingered contact plate which contacts the screen ring of the 4X150A tube. The other side is the chassis itself and a brass cover plate, which is grounded to the chassis by means of mounting screws. Two thin mica sheets between these conductors act as the dielectric, one being above and one below the spring-fingered contact plate.

(5) POWER AMPLIFIER.—The power amplifier employs two 4X150A tetrodes in a push-pull plate-and-screen modulated circuit; see figure 2–4. Excitation from tripler V604 is coupled into the grid circuit by L611, L612, and W601. The grid tank comprises L613, L614, C637A, and C638. C637A, a split-stator section of ganged capacitor C637, functions as the P.A. GRID TUNING control. C638, also a split-stator capacitor, is used to make alignment adjustments, as is L614. Grid-leak bias is developed across resistors R614 and R615, while protective bias of –42 volts is fed to the grid via the meter circuit in the Power Supply. When the meter switch is in the PA I_g position, PA grid current is monitored by the meter. The grid-return circuit is filtered by r-f bypass capacitors C640, C629, and C635.

The plate tank circuit consists of P.A. TUNING capacitor C645 and inductors L615 and L616. Plate voltage (525 volts) is applied through the plate-modulation winding of modulation transformer T103 and through r-f chokes L620 and L617 to the center-tap of L615. The plate supply is bypassed by capacitors C631, C636, and C641. The output from the PA stage is coupled from L616 to the output filter circuit.

The PA tubes are neutralized by capacitors C646 and C647. One plate of each capacitor consists of a short length of heavy wire connected to the stator

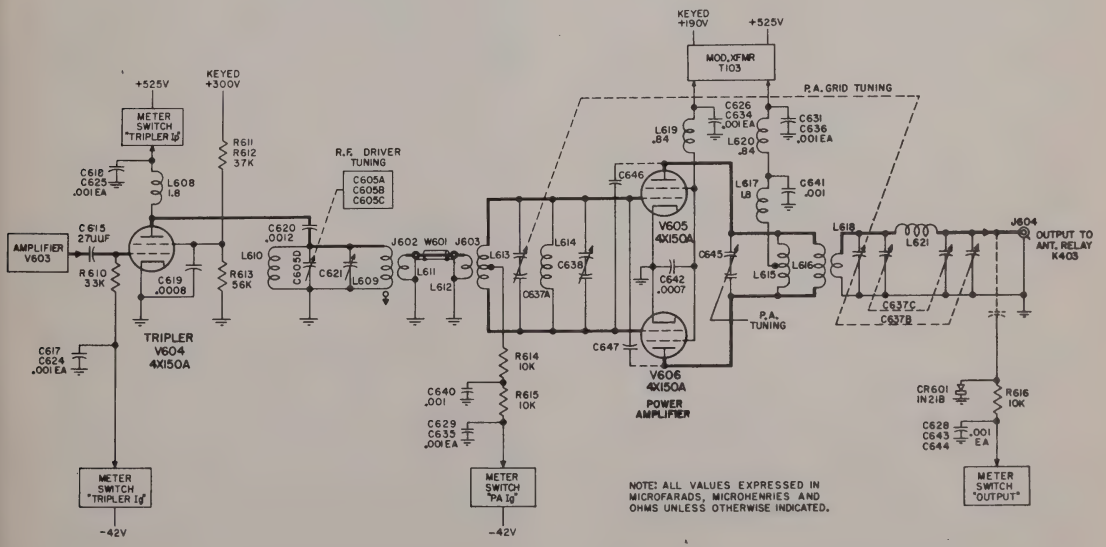


Figure 2–4. Tripler and Power Amplifier Stages, Simplified Schematic Diagram

of C637A. This wire lead is brought near the envelope of the tube opposite the end of C637A to which the wire is connected. The plate of that tube forms the other plate of the capacitor. The capacitance which then exists between the wire and the plate of the adjacent tube is sufficient to neutralize the grid-to-plate capacitance of the tube.

Screen-grid voltage (190 volts) is supplied to the PA tubes via the screen-modulation winding of T103 and r-f choke L619. The screen supply is bypassed for rf by capacitors C626 and C634, while the screen grids of both tubes are bypassed by C642. The latter component is a special bypass capacitor, used to reduce screen-grid impedance to ground, and is connected to the screen-grid rings of the PA tubes; see figure 7–20. The screen bypass capacitor uses the chassis as one plate. In the power-amplifier stage, a sheet of Teflon is placed on the chassis; the screen-grid connection is made through a metal plate above the Teflon sheet. The inner circumference of this plate is ringed with spring contacts, which fit against the screen-grid ring. Above the screen-connecting plate is an additional Teflon sheet topped by another metal plate, which is the other side of the capacitor. This top plate is grounded to the chassis by spring contacts and the mounting screws which hold the assembly together. By grounding the screens in this manner, the additional lead inductance of a normal capacitor is eliminated.

(6) OUTPUT FILTER.—An output filter network is included in the equipment to help prevent undesired frequencies, developed in the frequency-multiplier stages, from reaching the antenna and being radiated. As shown in figure 2–4, the output of the power amplifier is coupled into the filter circuit by L618. The configuration of the filter is that of a pi-network in which L621 forms the series inductive element and capacitors C637B and C637C serve as variable capacitive shunt elements. Both capacitors are split-stator types, having their rotors grounded; C637B is ganged with P.A. GRID TUNING capacitor C637A and tunes the filter over the range 115 to 156 megacycles. Tracking between C637B and C637A is accomplished by trimmer capacitor C637C. Output from the Amplifier-Oscillator unit is directly coupled to J604 from L621.

(7) OUTPUT MONITOR.—The output monitor circuit provides a *relative* indication of output power on the front-panel meter when the meter switch is set to OUTPUT. The reading obtained is not an absolute indication, since it will vary with frequency, increasing as the frequency increases; it will also vary with changes in loading and with the standing-wave ratio on the line to the antenna.

The monitor circuit uses a 1N21B crystal-diode rectifier and depends upon wiring capacitance to pick up the energizing signal. This signal produces a voltage across CR601. The signal voltage is then rectified by the crystal diode and filtered by R616, C628, C643, and C644. The d-c voltage thus produced is used to give the output power indications on the meter.

The following facts should be noted insofar as the meter readings obtained are concerned:

(*a*) The meter indicates voltage into a transmission line which may have a relatively high standing-wave ratio. The meter reading therefore will depend in part on the location of the maximum and minimum of the standing wave of voltage, which is indepenedent of the power through the transmission line.

(*b*) The meter reading will change with different crystal diodes.

(*c*) The d-c output of the crystal is not necessarily linear with the r-f input.

To measure the true output power, R-F Wattmeter ME-11/U must be used. If the wattmeter is substituted for the antenna and the P.A. TUNING control adjusted for maximum wattmeter reading, the wattmeter will indicate the true carrier power.

Neither the wattmeter nor the built-in voltage indicator will measure the side-band power under modulation, however, as they are average-voltage-reading devices. The average voltage with a given carrier level is independent of the modulation from zero to 100 percent. Any change in the meter readings under modulation indicates a shift in carrier level.

b. RADIO MODULATOR MD-163/URT.

(1) FIRST AUDIO AMPLIFIER.—The first audio stage employs V101, a 6BA6 pentode, as a resistance-coupled, high-gain voltage amplifier; see figure 2–5. The audio input signals from the microphone or handset are coupled across input transformer T101 and developed across R103 and R101. The latter serves as the SP AMP (speech amplifier) gain control. The signal then reaches the grid of V101 via capacitor C102. When AVC switch S102 is OFF, the grid is returned to ground through R142; the circuits involved when S102 is set to ON are discussed in subparagraph (2), below. The amplifier output is applied to AVC amplifier V102A by C105. When CLIP-FILT (clipper-filter) switch S103 is in the OFF position, the output is also coupled to the second audio amplifier (V104A) by C106. Plate voltage is obtained from the filtered 300-volt supply while screen-grid voltage is obtained from the voltage divider, R105 and R106. R104 serves as the plate-load resistor, and C104C is the screen-grid bypass capacitor.

(2) AVC AMPLIFIER AND RECTIFIER.—As shown in figure 2–5, the AVC amplifier is V102A, one half of a 12AU7 twin triode. A conventional resistance-coupled circuit is employed, in which fixed bias of –10 volts is applied to the grid through R108. The output signal, developed across plate load R109, is coupled to clipper V103 by C108 and to the cathode of the AVC rectifier by C107.

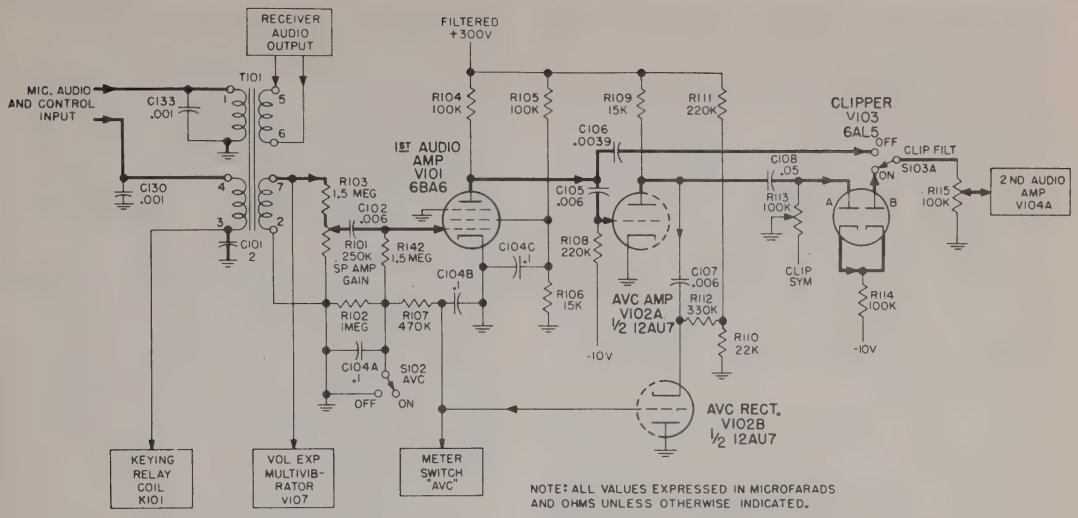


Figure 2—5. First Audio Amplifier, AVC, and Clipper Circuits, Simplified Schematic Diagram for MD-163/URT

The AVC rectifier utilizes V102B, the other section of the 12AU7 twin triode. The plate of V102B is grounded and the cathode is held at a positive potential by voltage divider R110 and R111, so that neither plate nor grid current can flow. When the signal from V102A, developed across R112 and R110, is applied to the rectifier cathode, the negative peaks drive the cathode negative with respect to the grid, resulting in a flow of grid current. Consequently, a rectified negative voltage appears across R107 and R102; these two resistors, in conjunction with C104A and C104B, form a filter network having a time-constant which eliminates audio-frequency variations from the AVC voltage.

AVC is provided primarily to maintain a signal of relatively constant amplitude at the input to the clipper stage for efficient clipping, regardless of the variation in speech amplitude. Therefore, it is likely that AVC will be utilized only when the clipper-filter circuit is also in use. When AVC switch S102 is in the ON position, the grid of V101 is returned to ground through R142 and R102, so that the negative AVC voltage across R102 controls the gain of that stage. On model MD-163A/URT, the grid of V101 is returned to ground through resistor R142 when switch S102 is in the OFF position.

The AVC position of the METER selector switch (S401) indicates whether or not AVC voltage is being developed. However, this metering circuit presents a low-impedance load to the diode rectifier, and impairs the operation of the AVC circuit. For proper AVC circuit performance, therefore, the METER switch must *not* be left in the AVC position.

(3) CLIPPER.—The output of AVC amplifier V102A is applied to clipper V103, a 6AL5 dual diode. The cathodes of both diodes are connected to a negative 10-volt bias source through a common cathode resistor, R114; therefore, both diodes draw plate current through R114. The plate of V103A is returned to ground through rheostat R113, and the plate of V103B through R115.

On the negative swing of the input signal, voltage is developed across R113 which decreases the voltage at the plate of V103A with respect to the cathode. The resultant drop in diode current lowers the voltage at the cathodes of V103A and V103B. Therefore, the conduction of the latter diode increases, causing an increased (negative-going) output signal voltage to be developed across R115. When the input to V103A reaches approximately −3.3 volts, the plate is sufficiently negative with respect to the cathode to cut off that diode. Any further decrease in signal input has no effect on V103A, since it remains cut off. Hence, the voltage at the cathodes of the diodes, the current through V103B, and the voltage across R115 remain constant beyond the point of cut-off, clipping any portion of the input signal which is below the negative 3.3-volt level.

On the positive swing of the input signal, the increased conduction through V103A increases the voltage at the cathodes of the two diodes. This causes the current flow through V103B to drop, resulting in a decreased (positive-going) output signal across R115. When the input to V103A becomes sufficiently positive, the current flowing through R114 (due to diode V103A) causes the voltage at the cathode of V103B to exceed that at the plate, cutting off that section of the clipper. Any further increase in signal amplitude cannot be transmitted to the succeeding second

audio amplifier; thus, the positive peaks of the input voltage are clipped.

Clipper-symmetry control R113 is part of the load across V103A. The setting of R113 determines, in part, the voltage which appears across R114 due to conduction of V103A. In turn, this voltage acts to cut off the diodes and provide the clipping action described above. The optimum setting of R113 is that which results in symmetrical clipping of the positive and negative signal peaks.

The action of the clipper stage and of the preceding AVC circuit assures high average side-band power and constant modulation levels over a wide range of voice signal strengths, and increases the intelligibility of speech when receiving signals of low signal-to-noise ratios.

(4) SECOND AUDIO AMPLIFIER.—As shown in figures 2–5 and 2–5A, the input to the second audio amplifier, V104A, may be obtained from either of two sources. With CLIP-FILT switch S103 in the ON position, the input is obtained from the clipper stage, V103. With S103 in the OFF position, the input is obtained from the first audio amplifier (V101) through C106. In both cases, the input voltage to this stage is varied by potentiometer R115, which functions as the MOD (speech modulation) level control.

The circuit of this stage appears in figure 2–6. V104A, one triode section of a 12AU7, functions as a conventional Class A voltage amplifier. Cathode bias is provided by R117, which is unbypassed to introduce a small amount of degenerative feedback. The plate load consists of filter Z101. When CLIP-FILT switch S103 is OFF, output from V104A is obtained directly from the plate of the tube, with Z101 having no effect upon the signal other than functioning as the plate load. When S103 is in the ON position, the audio voltage is taken from the output terminals of Z101.

Filter Z101 is a band-pass network whose cut-off frequencies are 300 and 3,500 cps. Consequently, it will pass frequencies within that range, but will attenuate all others. When the audio peaks are clipped by V103, the resulting square-topped waveforms contain harmonics of the fundamental audio frequency. Z101 eliminates the component frequencies above 3,500 cps, minimizing high-frequency distortion and preventing modulation of the r-f carrier by those frequencies.

(5) THIRD AUDIO AMPLIFIER.—The input to the third audio amplifier, V104B, is provided by one of two sources, as indicated in figure 2–6. When switch S101 is in the PHONE position, speech input is coupled to the grid via C112. With S101 set to MCW, the 1,000-cps tone from the MCW oscillator is applied to the stage.

When PHONE operation is employed, VOL EXP

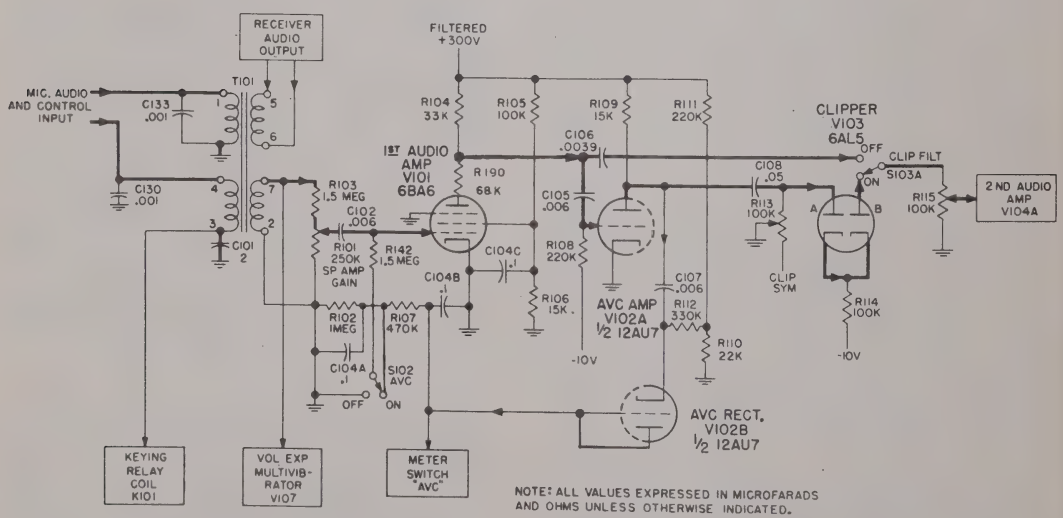


Figure 2–5A. First Audio Amplifier, AVC, and Clipper Circuits, Simplified Schematic Diagram for MD-163A/URT

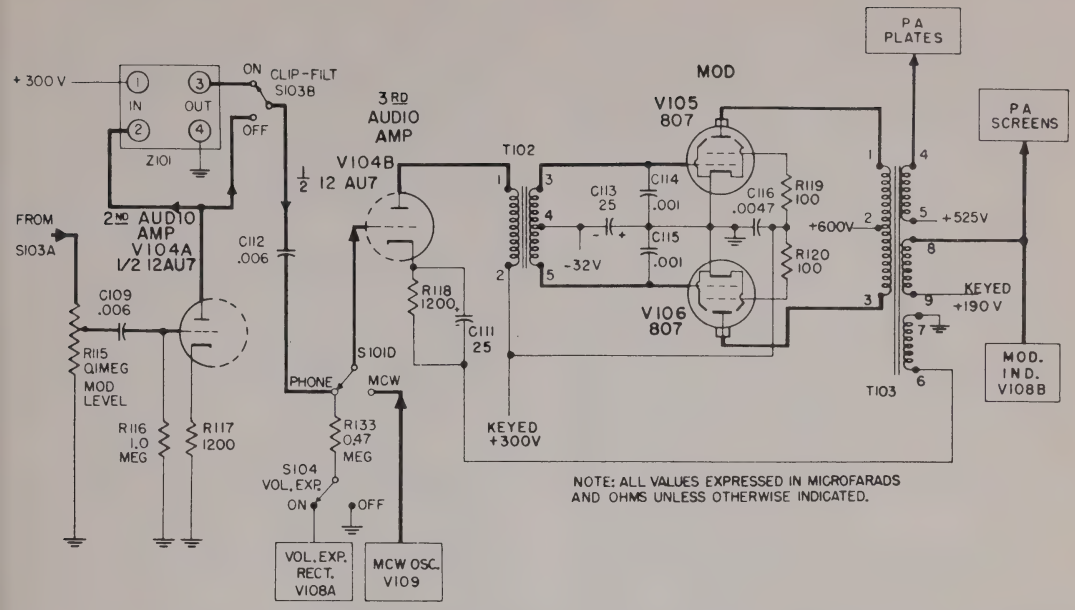


Figure 2—6. Second and Third Audio Amplifiers and Modulator Stage, Simplified Schematic Diagram

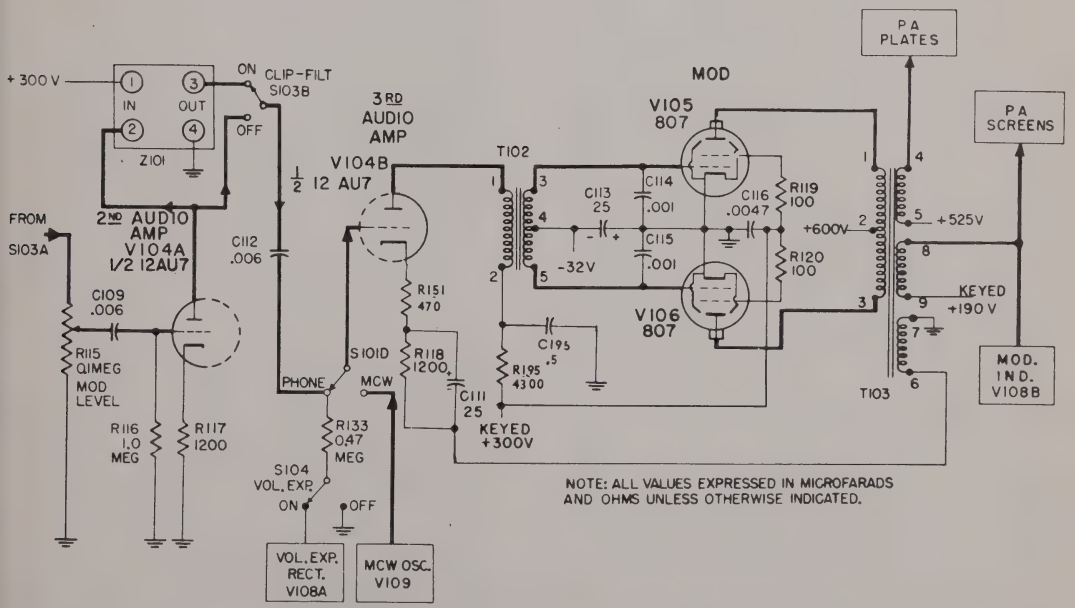


Figure 2—6A. Second and Third Amplifiers and Modulator Stage, Simplified Schematic Diagram for MD-163B/URT

(volume expander) switch S104 may be either ON or OFF. With S104 at the OFF position, the grid of V104B is returned to ground through R133 and the tube operates as a conventional Class A amplifier with cathode bias provided by R118 and C111. With S104 at the ON position, the grid is returned to a negative 42-volt biasing potential, which cuts the tube off and permits operation only when the volume-expander circuit acts to remove the bias. Refer to paragraph 2*b*(7).

Degenerative feedback is introduced into the cathode circuit of V104B by means of an additional secondary winding on the transformer in the modulator circuit which succeeds this stage. This winding, terminals 6 and 7 of T103, is directly between the cathode and ground, and introduces a negative-feedback voltage in order to reduce distortion generated in the modulator.

The output of the third audio amplifier is coupled to the modulator tubes via T102, the primary winding of which is in the plate circuit of V104B, and the secondary of which is in the grid circuit of the succeeding modulator stage. In model AN/URT-7B, the combination of resistor R195 and capacitor C195 reduces transient voltages in transformer T102 and prevents overloading the power amplifier plate supply bypass capacitors C631, C636, and C641 when plate power is removed from tube V104B.

(6) MODULATOR STAGE.—Two 807 beam-power tubes (V105 and V106) are operated in push-pull as a Class AB_1 modulator stage; see figure 2–6. Bias is provided from the negative 32-volt tap of the bias bleeder network, and is fed to the center-tap on the secondary of T102. Since the stage is operating Class AB_1, no grid current flows and very little loading of the third audio amplifier occurs. C113 serves to hold a constant bias on the tubes by keeping the center-tap of T102 secondary at a-c ground potential. Capacitors C114 and C115, connected from the grids to ground, attenuate the higher voice frequencies, which may be present when audio filter Z101 is not used, without materially affecting the lower frequencies.

Plate voltage for V105 and V106 is supplied through the center-tap of the primary winding of the modulation transformer, T103. Screen-grid voltage is obtained from the keyed 300-volt supply. Because of the possibility that parasitic oscillations may occur in the screen-grid circuit, suppressor resistors R119 and R120 are inserted, while capacitor C116 serves as a common a-f bypass to ground.

Modulation of the plates and screen grids of the radio-frequency power amplifier is accomplished by two separate secondary windings of T103. The audio voltage produced in these secondary windings varies the d-c voltage applied to the r-f power amplifier plates and screen grids. A third winding (terminals 6 and 7) develops feedback voltage for the third audio amplifier, as described in paragraph 2*b*(5).

(7) VOLUME EXPANDER.—The volume-expander circuit shown in figure 2–7 is used to prevent modulation of the r-f carrier by background noise during voice transmission. This is accomplished by cutting off the third audio amplifier whenever speech input to the microphone ceases.

(*a*) VOLUME-EXPANDER MULTIVIBRATOR.—Multivibrator V107, a 12AU7 twin triode, functions as a monostable ("one-shot") circuit. The grid of triode B is returned to ground through potentiometer R121, the EXP (volume expander) control, while the grid of triode A is connected to a positive source. Signal is applied from the microphone input transformer, T101 (shown in figure 2–5), and applied to potentiometer R121 via resistor R122. The insertion of R122 provides isolation and prevents overloading of the T101 secondary if the grid of V107B conducts on positive audio peaks. R121 provides an adjustment of the signal level fed to the volume-expander circuit.

With no input signal, V107A conducts under a zero-bias condition because its grid is connected to the 300-volt supply through R127. The conduction develops a high bias voltage across the common cathode resistor, R123, and keeps triode B cut off. However, V107B will start to conduct when a positive voltage of sufficient magnitude to overcome the cut-off bias is applied to the grid. The resulting negative voltage appearing across the V107B plate-load resistor (R124) is coupled through C117 to the grid of triode A and cuts off that section, leaving V107B conducting. Then C117 starts to discharge through R127 and the voltage at the grid of section A starts to rise. When it exceeds the cut-off voltage, section A starts to conduct again; this causes the common cathode voltage to rise and effectively lowers the bias on the grid of section B and causes the current in that tube to decrease. When the plate current of section B is decreased, its plate voltage increases and this, in turn, is transmitted to the grid of section A, which increases the grid voltage of that tube. Thus the circuit rapidly returns to its initial condition.

The resultant output from the multivibrator, developed across plate-load resistors R125 and R126, is a positive square wave which is applied to the succeeding diode rectifier. This output occurs whenever audio voltage of sufficient amplitude is present at the grid of V107B. EXP LEVEL control R121 is adjusted to a satisfactory voice level so that square-wave output is obtained from V107 whenever the operator talks.

(*b*) VOLUME-EXPANDER RECTIFIER AND CLAMP.—The output of V107A is coupled by C118 to diode rectifier V108A, which is used to rectify the positive square wave. Both the plate and cathode

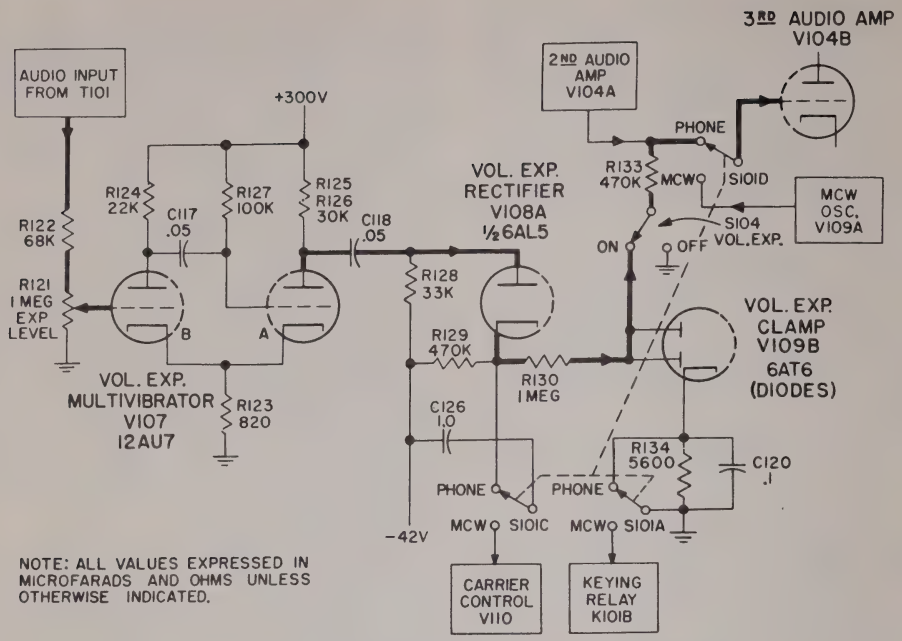


Figure 2–7. Volume-Expander Circuit, Simplified Schematic Diagram

of this tube are returned to a negative 42-volt potential. When switch S101 is in the PHONE position and VOL EXP switch S104 is ON, the 42-volt bias is applied to the grid of V104B via resistors R129, R130, and R133, holding that tube in a cut-off condition. The positive square-wave output from multivibrator V107 causes diode V108A to conduct through R128 and R129. The portion of voltage which appears across R129, positive at the cathode end of the resistor, overcomes the cut-off bias on V104B and permits that stage to amplify the speech input. During speech pauses, or between syllables, V104B would again return to cut-off, distorting the speech, except for the long time-constant of C126 and R129, through which the bias must be applied. The time-constant is sufficient to hold the stage in operation during such pauses.

To prevent the positive voltage developed by V108A from maintaining the grid of V104B at too high a positive potential, a clamping circuit is included in the volume expander. This circuit employs both diode plates (V109B) of a 6AT6 dual-diode-triode. The positive voltage applied to the diode plates causes conduction to occur, producing a voltage across R130 which counteracts that due to V108A. Thus, the grid of V104B is kept practically at ground potential. R134 and C120, in the cathode circuit of V109, are shorted out by S101A; they function as part of the MCW-oscillator circuit when S101 is set to MCW, as discussed in subparagraph (8), below. Similarly, C126, connected to S101C, serves as part of the carrier-control circuit during MCW operation; refer to subparagraph (9).

(8) MCW OSCILLATOR.—For MCW operation, 1,000-cycle audio voltage is provided by the triode section (A) of V109, operating as a phase-shift oscillator; see figure 2–8. In this oscillator, a network of resistors (R135 through R138) and capacitors (C121 through C124, C129) are inserted between grid and plate so that a 180-degree phase shift is obtained at the desired output frequency. Since tube gain is sufficient to overcome network losses, regeneration is established and stable oscillation results. C124 is a screwdriver-adjusted variable element to provide a limited amount of frequency adjustment. Cathode bias is used, as developed across R134 and C120.

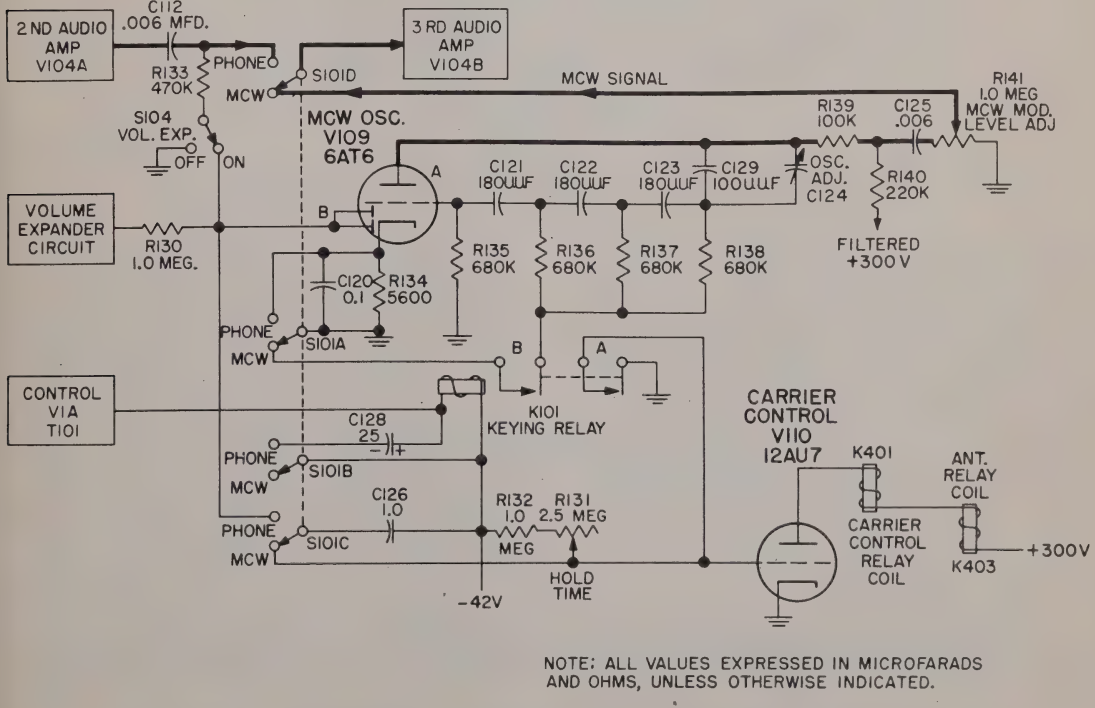
The oscillator is keyed by operation of keying relay K101, which has two sets of contacts that operate simultaneously. One set (B) grounds the common connection of R136, R137, and R138 (through S101A in the MCW position) to make the MCW oscillator operative. The other provides a necessary ground in the carrier-control circuit, as explained in subparagraph (9) following. Output from the MCW

oscillator is taken via isolation resistor R139, C125, and MCW modulation level control R141. With S101 in the MCW position, this output is fed to the grid of the third audio amplifier, V104B.

(9) CARRIER CONTROL.—The carrier-control circuit utilizes V110, a 12AU7 twin triode having its two sections connected in parallel; it is shown functionally as a single triode in figure 2–8. The tube is used to activate carrier-control relay K401 and antenna change-over relay K403, both located on the Power Supply chassis. These relays are in series with each other and with V110, and are energized when the tube conducts. Plate power for V110 is obtained via dropping resistors in the Power Supply and coils of relays K401 and K403. The grids of V110 are subject to a negative 42-volt bias applied via R131 and R132; this maintains V110 in a nonconducting condition, and K401 and K403 are therefore de-energized.

When the microphone or handset press-to-talk switch is operated, keying relay K101 is energized. Contact set A grounds the grid of V110, and the tube conducts to energize K401 and K403. The carrier-control relay (K401) contacts apply B+ voltage to make the Radio Transmitter operative, while the antenna relay (K403) transfers the antenna to the Radio Transmitter. The 42-volt negative bias is not shorted by grounding the grid of V110, since R132 and part of R131 are always in series with the voltage source.

When switch S101 is in the MCW position, provision is made for holding the carrier on during the short keying intervals. Note that S101C transfers C126 to the grid of V110, in parallel with the series combination of R131 and R132. When the grid of V110 is grounded by contact A of keying relay K101, C126 charges rapidly to the 42-volt bias potential. When the key is opened and the ground is removed from the grid, the charge of C126 opposes the negative 42-volt bias and maintains V110 in a conducting condition until the capacitor has partially discharged through R131 and R132. The time-constant of those resistors with C126 is sufficiently long to hold the carrier on the air approximately one second after the key is opened. At the end of this time, V110 is again cut off by the bias, and K401 and K403 are de-energized to return the equipment to the stand-by position. R131 is variable for setting the time delay of this circuit. This "constant carrier" delay bias is not provided in the PHONE



NOTE: ALL VALUES EXPRESSED IN MICROFARADS AND OHMS, UNLESS OTHERWISE INDICATED.

Figure 2–8. MCW Oscillator, Carrier-Control Circuit, and MCW-PHONE Switch Circuits, Simplified Schematic Diagram

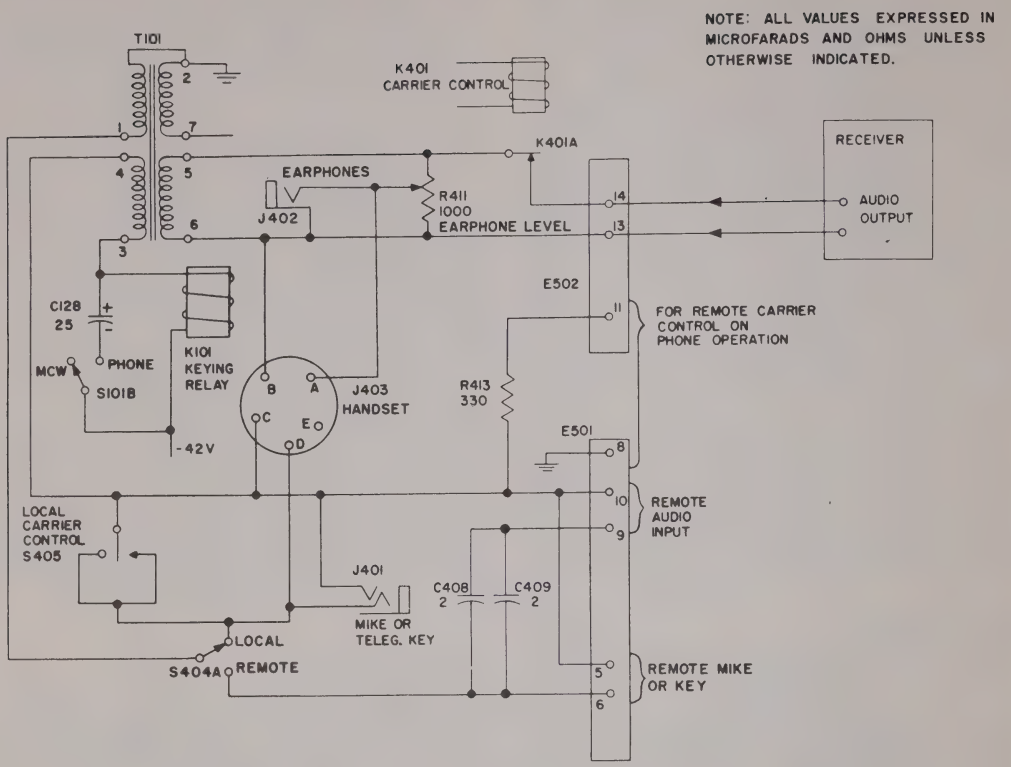


Figure 2–9. Audio Monitoring Circuit, Simplified Schematic Diagram

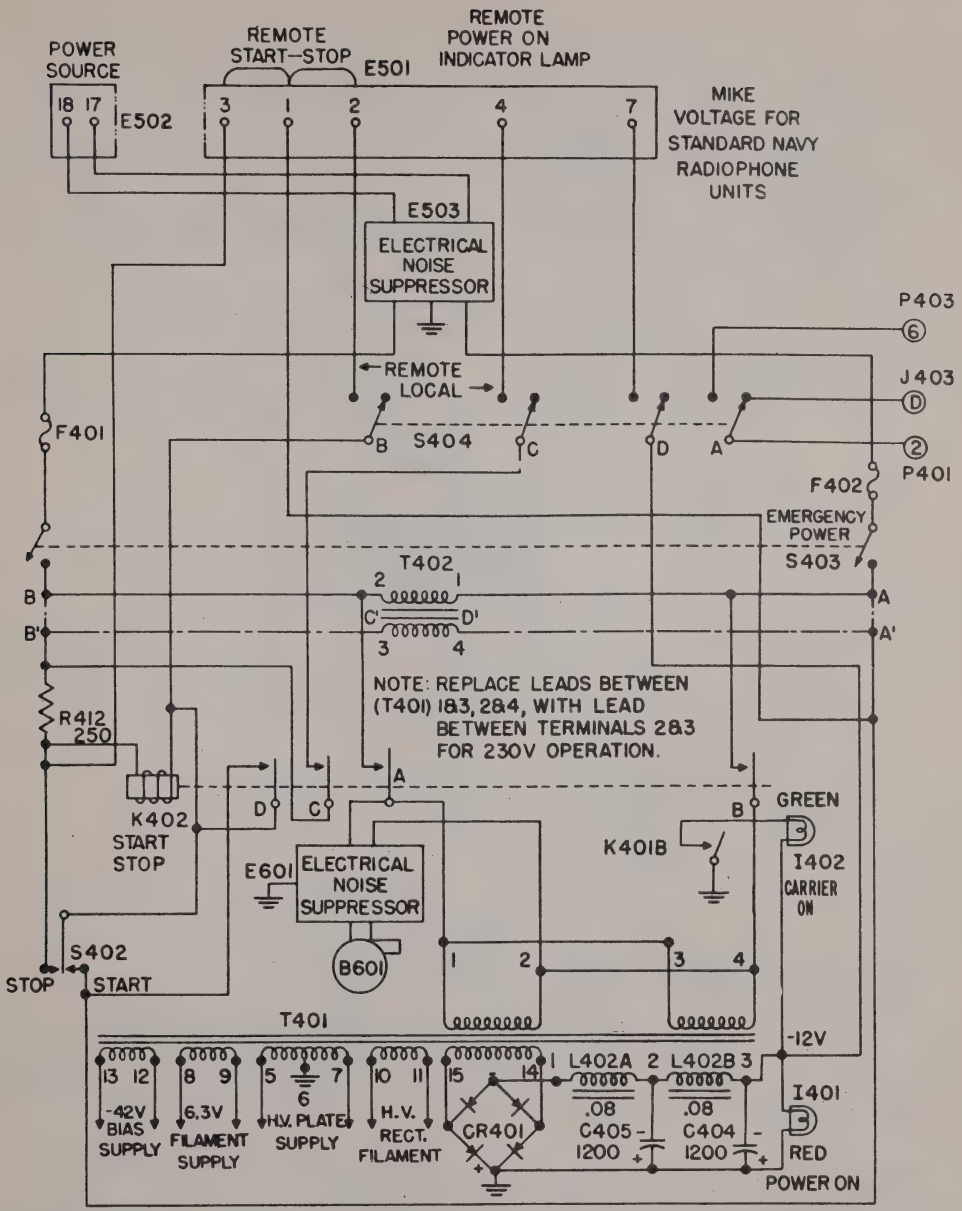
position of S101, since the microphone press-to-talk switch is normally kept closed until the transmission is ended, at which time the carrier is not desired.

(10) MODULATION RECTIFIER.—V108B, half of a 6AL5 twin diode, is used as a rectifier to provide a means of indicating the modulation level on M401; the circuit is shown in figure 2–13, switch position 6. The meter is in series with R144 and R414; the three components are connected across the diode and the screen-grid secondary winding of modulation transformer T103. The rectifier serves to shunt the meter on positive half-cycles of the audio signal but permits meter conduction on negative half-cycles. Therefore, the meter reading will indicate the relative modulation signal amplitude.

(11) AUDIO MONITORING CIRCUIT.—The audio monitoring circuit enables the operator to listen to the ouput of the receiver when the transmitted carrier is off, and to speech side-tone when the carrier is on. A simplified diagram of the monitoring circuit appears in figure 2–9. Monitoring may be accomplished either locally or remotely.

Receiver audio is brought in via terminal board E502, terminals 13 and 14, and contacts A of relay K401. It is fed to EARPHONE LEVEL potentiometer R411 as well as to the tertiary winding (terminals 5 and 6) of the input transformer, T101. When the carrier is off, that is, when carrier-control relay K401 is de-energized, the receiver audio may be monitored locally by plugging phones into the front-panel EARPHONES jack, J402. For remote operation from Transmitter Control Navy Type -23555 (not supplied with this equipment), the receiver audio is induced into the split primary winding of T101, which is connected to the remote-control lines (terminals 5 and 6 of E501). The receiver signal reaches the remote station via the control circuit. When Remote Radiophone Unit Navy Type -23500 (not supplied with this equipment) is used for remote operation, conections are made directly between that unit and terminals 13 and 14 of E502, in addition to those from the receiver. Thus, the receiver audio output is applied directly to the remote unit.

When the r-f carrier is on, relay K401 disconnects

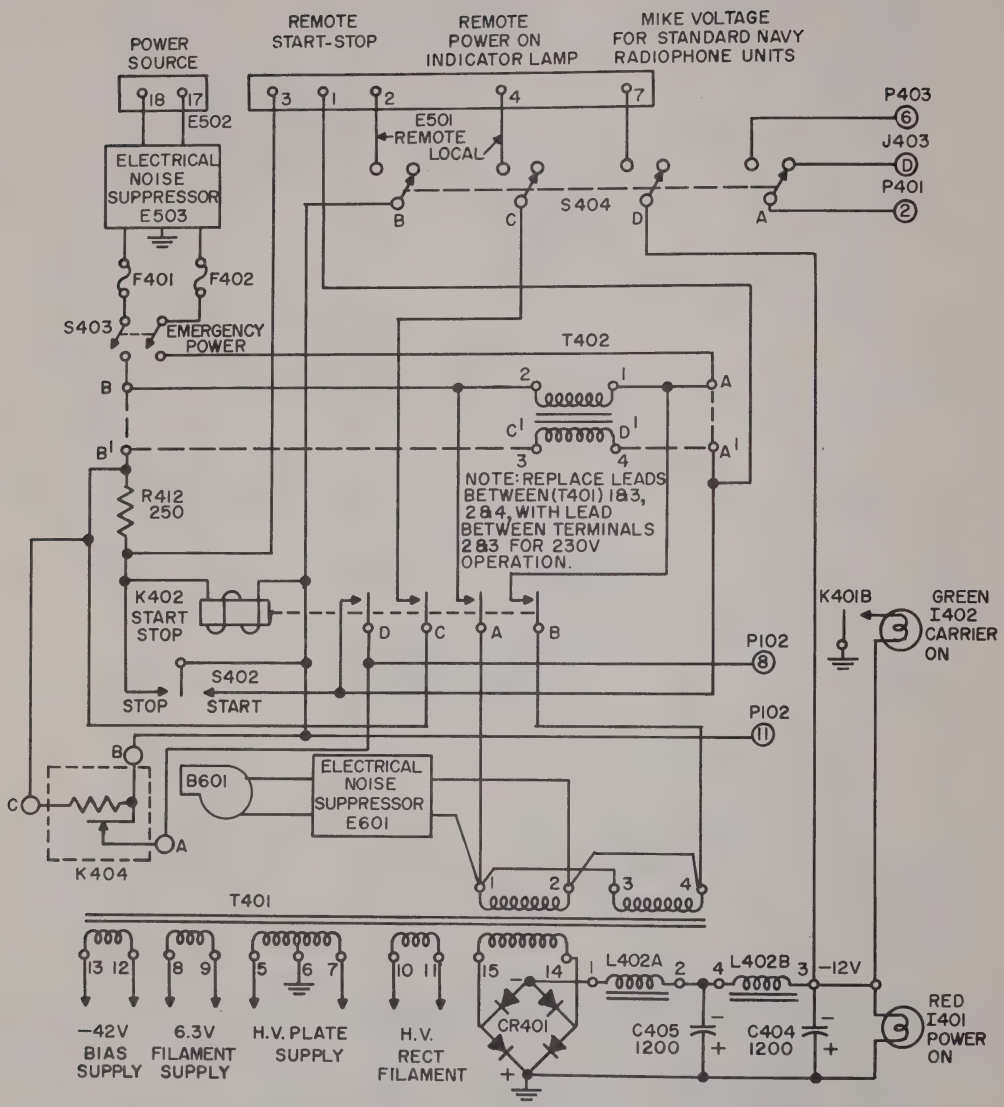


NOTE: CONNECT A-A' & B-B' (T402) STRAPPING ONLY FOR 115V OPERATION.

CONNECT B'-C' & A'-D' STRAPPING ONLY FOR 230V OPERATION.

NOTE: ALL VALUES EXPRESSED IN MICROFARADS, HENRIES AND OHMS UNLESS OTHERWISE INDICATED.

Figure 2–10. Primary Power Distribution, Simplified Schematic Diagram



NOTES:
1. CONNECT A-A' & B-B' (T402) STRAPPING ONLY FOR 115V OPERATION.
2. CONNECT B'-C' & A'-D' STRAPPING ONLY FOR 230V OPERATION.
3. ALL VALUES EXPRESSED IN MICROFARADS, HENRIES AND OHMS UNLESS OTHERWISE INDICATED.

Figure 2—10A. Primary Power Distribution, Simplified Schematic Diagram for AN/URT-7B

the receiver audio, In this case, microphone side-tone is obtained from the tertiary winding of T101 and is impressed across potentiometer R411 for local monitoring via J402. If operation of the equipment is accomplished remotely from Transmitter Control Navy Type -23555, the microphone side-tone is obtained directly from the remote-control unit. When employing Remote Radiophone Unit Navy Type -23500, or equivalent, side-tone is obtained from the receiver.

c. POWER SUPPLY PP-773/URT.

(1) PRIMARY POWER CIRCUIT. (*See figure 2-10 and 2-10A.*)

—Satisfactory operation of the equipment requires that the 115/230-volt, 50/60-cps, single-phase power source vary not more than ±10 percent in voltage or ±5 percent in frequency. The input power is applied to terminals 17 and 18 of terminal board E502, thence through an electrical noise suppressor, E503. Fuses F401 and F402 provide line protection, and S403 is the POWER ON-EMERGENCY OFF switch. A 2:1 ratio step-down transformer (T402) is used only when the input power is supplied from a 230-volt source. The START-STOP momentary-contact switch, S402, energizes primary power relay K402 whose contacts control the power to T401, the power indicator lamps on the Remote Radiophone Unit Navy Type -23500 or equivalent (when used), and provide a holding voltage for the coil of K402. In model AN/URT-7B relay K404 is normally closed, but opens and turns the transmitter off when the blower motor fails. Optional connections on T401 and T402 provide for operation either on 115 or 230 volts. Electrical noise suppressor E601 prevents the introduction in the equipment of any electrical noise generated by blower B601.

(2) HIGH-VOLTAGE RECTIFIER.—The high-voltage rectifier uses two 3B28 gas-filled half-wave rectifier tubes, V401 and V402, arranged for full-wave rectification, to supply all stages of the Radio Trans-

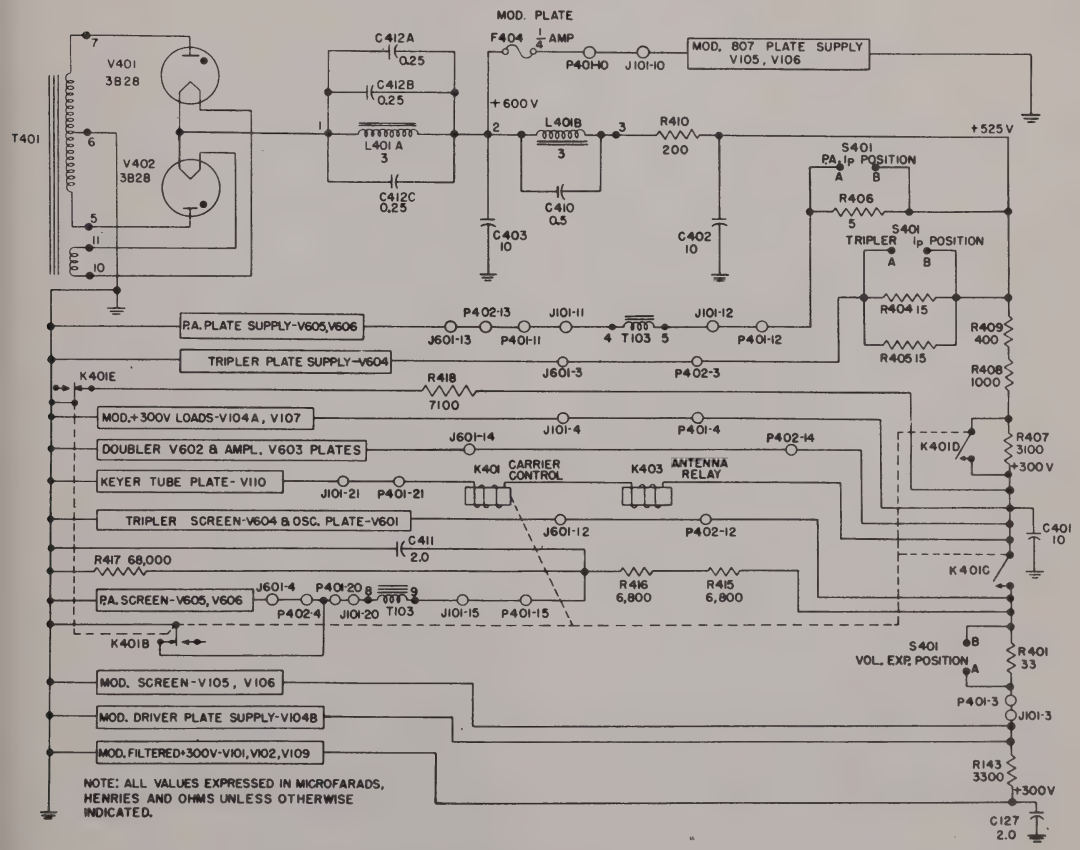


Figure 2—11. High-Voltage Rectifier and D-C Distribution, Simplified Schematic Diagram

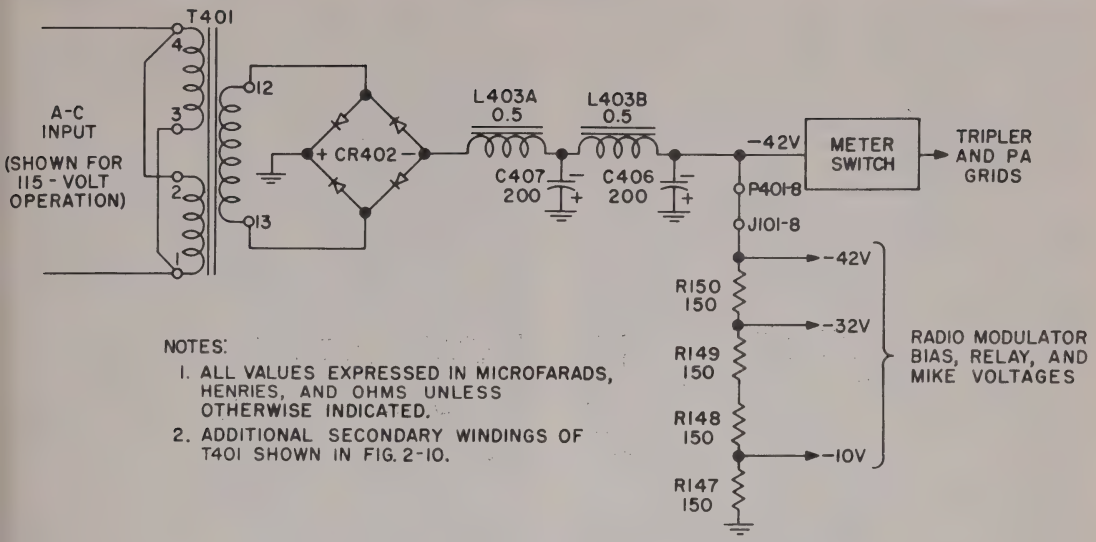


Figure 2–12. Bias Rectifier, Simplified Schematic Diagram

mitter with plate and screen power; see figure 2–11. A five-volt filament winding (terminals 10 and 11) for these tubes is included in T401. Terminals 5, 6, and 7 of T401 connect to the high-voltage winding; terminal 6 is the grounded center-tap. In each half of the transformer windings, 720 volts ac are induced and, with a two-section choke-input filter, 525 volts dc at 370 ma and 600 volts dc at 130 ma are obtained at the output points. The modulator plate supply is tapped from the first section of the filter L401A and C403 at +600 volts and fed through fuse F404 and pin 10 of P401 and J101 to the center-tap on the primary of the modulation transformer, T103. The output of L401B, R410, and C402, the second section of the filter, supplies d-c plate power at +525 volts to the tripler and PA plates. The output of this second filter section is also applied through dropping resistors R407, R408, and R409 to R418, and the 300-volt loads in the Radio Modulator and Amplifier-Oscillator chassis, to contact C of K401. C401 is an additional filter for this supply. Those stages requiring a keyed 300-volt supply do not have power applied until the carrier is turned on, thereby energizing K401. When K401 is energized, contact C applies the positive 300 volts. An R-C filter network, R143 and C127 (located in the Radio Modulator unit), supplies additional filtering for V101, V102, and V109. The additional load of these stages is prevented from increasing the voltage drop across R407, R408, R409, and R410, and decreasing the voltage below the 300-volt level because R407 is shorted out by contact D of K401 and the R418 load is removed from the supply by contact E of K401. The drop across R408, R409, and R410 at a higher current maintains the voltage supply at 300 volts.

Capacitors C412A, B, and C are connected across filter choke L401A. The inductive reactance of the choke and the capacitive reactance are selected so that the combination is resonant at the ripple frequency. Increasing the series impedance for the ripple frequency in this manner provides better filtering. Similarly C410 is connected across L401B to improve the filtering of the second filter section.

(3) LOW-VOLTAGE RECTIFIER. (*See figure 2–10.*)—The negative 12-volt output of the full-wave, bridge-type rectifier, CR401, is used to supply the remote microphone power when Remote Radiophone Unit Navy Type -23500, or equivalent, is used. It also supplies the power for the local indicator lamps I401 and I402, POWER on and CARRIER on respectively. When the Remote Radiophone Unit is not used, only the latter function is served. The output of the rectifier is taken through a two-section choke input filter network consisting of L402A, L402B, C404, and C405.

The bridge-type rectifier supplies unidirectional current in the following manner: when the phase of the a-c voltage across the secondary of T401 is such that terminal 15 is positive and terminal 14 is negative, current will flow from terminal 15 through one section of the selenium rectifier to ground, through the indicator lamps, through L402B, L402A, and through one section of the rectifier to terminal 14.

On the subsequent half-cycle, terminal 14 is positive and terminal 15 is negative. Then current will flow from terminal 14 to ground through one sec-

tion of the rectifier, through the indicator lamps, through L402B, L402A, and through one section of the rectifier to terminal 15. In this manner current is always flowing in the same direction through the lamp load. In each case, the arrowhead part of the selenium-rectifier symbol gives the direction of conventional current flow.

(4) BIAS RECTIFIER.—Bias rectifier CR402 is a full-wave, bridge-type selenium rectifier which operates in the same manner as CR401; see figure 2–12. It supplies a negative 42-volt output to the divider network R147, R148, R149, and R150, located in the Radio Modulator unit. All current and voltages required by the biased stages, keying relay K101, and microphone (for local operation or remote operation employing Transmitter Control Navy Type -23555) are supplied by this rectifier. Bias for the r-f tripler and PA stages is also obtained from the rectifier. The filter network for the rectifier is comprised of L403A, L403B, C407, and C406.

d. METERING CIRCUIT.—The metering circuit is provided to enable personnel to tune and maintain the transmitter. All currents and voltages necessary for tuning and aligning the equipment are measured by meter M401; a simplified schematic diagram of each circuit associated with METER switch S401 appears in figure 2–13. The following conditions of operation can be measured:

(1) "DOUBLER I_g" POSITION.—With S401 set to this position, meter M401 measures the grid current in the doubler stage of the Amplifier-Oscillator unit. The oscillator tank is tuned using this position.

(2) "TRIPLER I_g" POSITION.—With S401 in this position, meter M401 measures the grid current of the tripler stage. The doubler and grounded-grid amplifier tanks are tuned using this position.

(3) "PA I_g" POSITION.—With S401 in this position, meter M401 measures grid-current flow in the r-f power amplifier. The PA grid and tripler plate tanks are tuned using this position.

(4) "OUTPUT" POSITION.—This position of S401 connects M401 in series with the power-output monitor rectifier. The monitor circuit absorbs and rectifies a portion of the output at the antenna coil, providing a small d-c current for the meter; refer to paragraph 2*a*(7), this section. The PA plate tank is tuned in this position.

(5) "AVC" POSITION.—This position of S401 connects the meter across the output of the AVC rectifier to provide an indication of AVC voltage.

Note

The AVC position of METER switch S401 is intended only to provide a means of checking AVC voltage during tests or adjustments. The metering circuit impairs the operation of the AVC circuit; therefore S401 must *not* remain in the AVC position during actual operation.

(6) "MOD" POSITION.—This switch position places the meter circuit in shunt with modulation rectifier V108B, providing an indication of modulation amplitude. The operation of this circuit is explained in paragraph 2*b*(10) of this section.

(7) "VOL EXP" POSITION.—The meter, in this switch position, is placed in series with the keyed 300-volt line to the audio circuits. Plate voltage for V104B, as well as screen voltage for the modulator tubes (V105 and V106), is obtained from this source. After being filtered by R143 and C127, the 300-volt source also supplies plate voltage for V101, V102, and V109. Of the total current through the meter, that drawn by V104B forms a substantial portion. When V104B is cut off, the reading of M401 is relatively low (approximately 40). However, when the output from the volume-expander circuit permits V104B to conduct, the meter reading rises to a higher value (approximately 80). Thus, the meter current provides an indication of volume-expander action.

(8) "TRIPLER I_p" POSITION.—With S401 in this position, meter M401 measures the plate-current flow in the tripler stage. Plate tank-circuit resonance is indicated in this position.

(9) "PA I_p" POSITION.—Meter M401 indicates power-amplifier plate current when switch S401 is set to this position

e. CONTROLS AND CONTROL CIRCUITS.—The various switches, relays and control circuits included in the Radio Transmitter are discussed in the following subparagraphs. Where the control circuits have been described in other paragraphs of this section, appropriate references are made thereto.

(1) "POWER ON-EMERGENCY OFF" SWITCH, S403.—S403 is the line power switch and is a toggle-type switch on the front panel of the Power Supply. It controls both sides of the input power line and must be closed in order to start the equipment with the START-STOP switch S402; see figure 2–10. Likewise, if an emergency requires, power can be quickly removed from the entire equipment by throwing S403 to the EMERGENCY OFF position.

(2) "START-STOP" SWITCH, S402.—This control is a toggle-type momentary-contact (nonlocking) front-panel switch used to start or stop the equipment, after S403 has been closed; see figure 2–10. Momentary closure of S402 on the START side energizes start-stop relay K402, which locks itself in with its own contact pair D. K402 then remains energized until its coil is shorted by momentarily pressing S402 down to the STOP position.

(3) "LOCAL-REMOTE" SWITCH, S404.—S404 is a rotary switch located on the Power Supply panel, accessible through the access door leading to the Radio Modulator panel. When set to LOCAL, S404A connects the local handset, microphone jack, and local carrier control switch S405 across the input winding of input transformer T101, to provide local

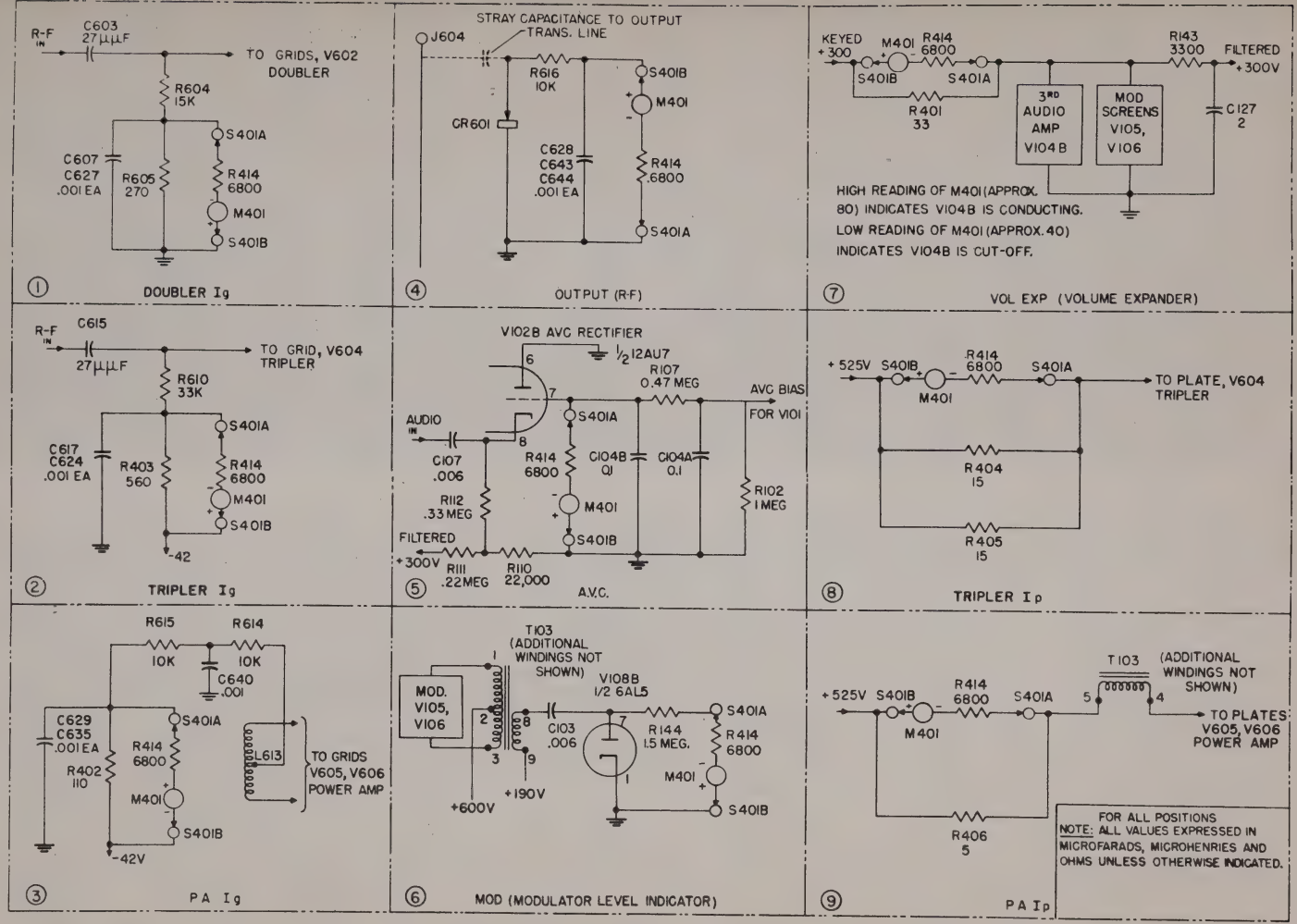


Figure 2–13. Meter Circuits for All Positions of METER Switch, Simplified Schematic Diagram

control of the carrier; see figure 2–9. Switch S404 disconnects indicating and control functions from all remote units by operation of its other sections, as shown in figure 2–10. Turning the switch to the REMOTE position causes the following to take place (see figures 2–9 and 2–10):

(*a*) S404A connects the input winding of T101 to terminal 6 of E501 (via P403 and J501). This connects the handset, microphone, or key in the remote unit to the Radio Transmitter, and disables local carrier-control circuits.

(*b*) S404B applies the common lead of the start-stop circuit to the REMOTE-OFF switch of a Remote Radiophone Unit (if used).

(*c*) S404C connects one side of the 115-volt a-c line to pin 4 of E501 (via P403 and J501), which applies power to the indicator in a Remote Radiophone Unit; the other side of the line is always connected through pin 1 of E501, J501, and P403.

(*d*) S404D applies a negative 12 volts, the output of selenium rectifier CR401, to pin 7 of E501 (via P403 and J501) to supply microphone current to a Remote Radiophone Unit, when used.

(4) "MCW-PHONE" SWITCH, S101.—S101 is a rotary switch mounted on the Radio Modulator front panel; the switch circuits are shown in figure 2–8.

(*a*) S101A.—In the MCW position, this section grounds the stationary contact of K101B. When K101 is energized by the key, contact set B grounds R136, R137 and R138 of the phase-shift oscillator, allowing the oscillator to function. In the PHONE position, section S101A grounds the cathode of V109 to clamp the volume-expander output at ground potential via the diode portions of V109; refer to paragraph 2*b*(7)(*b*), this section.

(*b*) S101B.—In the MCW position, this section disconnects C128 from K101 to allow rapid keying of K101. In the PHONE position, this section connects C128 across K101 to bypass the audio input voltage that would otherwise appear across K101.

(*c*) S101C.—In the MCW position, this section connects C126 across R131 and R132 to provide the time-constant required to keep the carrier on between keying intervals and for approximately one second after the key is open. This circuit function is explained in paragraph 2*b*(9) of this section. In the PHONE position, C126 is connected to the output of the volume-expansion rectifier to introduce a time-constant sufficiently long to prevent cutting off modulation between syllables or words. Refer to paragraph 2*b*(7)(*b*) for an explanation of this circuit.

(*d*) S101D.—In the MCW position, this section connects the input of the third audio amplifier (V104B) to the MCW modulation level control R141, across which the MCW-oscillator output appears. In this operating mode, the low-level audio, clipper-filter, AVC, and volume-expander circuits are disconnected from the Radio Modulator output stages. In the PHONE position, S101D connects the output of V104A to the input of V104B, and provides for connecting the V104B grid-return either to ground or to the volume-expander circuit.

(5) "CARRIER TEST" SWITCH, S405.—S405 is a toggle switch which turns on the r-f carrier for test purposes when pressed either up or down. It locks in its upper position so that the carrier may be kept on without holding the switch, while the lower position is nonlocking for tests of short duration. S405 is connected across the microphone line (figure 2–9) and operates keying relay K101 in the same manner as the handset press-to-talk button, except that during use of S405 the microphone audio output is shorted.

(6) "METER" SWITCH, S401.—The circuits associated with S401, the front-panel control which permits meter M401 to monitor various voltages and currents in the Radio Transmitter, are described fully in paragraph 2*d*, this section.

(7) "CRYSTAL SELECTOR" SWITCH, S601.—S601 is a turret-type switch with provision for mounting four crystals on its revolving section. It is used to connect the desired crystal into the r-f oscillator circuit. The crystals in the turret unit may be replaced readily where it is required that new channels be used, or when a crystal must be replaced because of defective operation. The switch is mountd on the front panel of the Amplifier-Oscillator unit.

(8) "R.F. DRIVER TUNING" CONTROL.—This dial, mounted on the Amplifier-Oscillator front panel (behind the access door), is the control for the four ganged sections of C605. These capacitor sections tune the plate tanks of V601, V602, V603, and V604; see figures 2–3 and 2–4.

(9) "P.A. GRID TUNING" CONTROL—This front-panel dial (behind the Amplifier-Oscillator access door) drives the ganged sections A and B of capacitor C637. These capacitors tune the PA grid tank and the pi-section output filter, as shown in figure 2–4.

(10) "P.A. TUNING" CONTROL.—This is also a dial on the Amplifier-Oscillator front panel (behind the access door); it controls the tuning of capacitor C645, in the PA plate circuit.

(11) "SP AMP" CONTROL, R101.—Potentiometer R101 is the speech-amplifier gain control located on the Radio Modulator front panel. It is used to set the signal level into the first audio amplifier (V101), as described in paragraph 2*b*(1) of this section.

(12) "MOD" CONTROL, R115.—This potentiometer, located on the front panel of the Radio Modulator unit, is the speech modulation-level control; it is used to adjust the level of signal input to the second audio amplifier, V104A. This sets the modulation level after clipper action has created a

uniformity in the amplitude of signal peaks; see figure 2-5.

(13) "EXP" CONTROL, R121.—This Radio Modulator front-panel potentiometer control determines the signal level at which the volume-expander circuit will make the speech circuits operative. It is actually a signal-gain control at the grid of volume-expander multivibrator V107, as shown in figure 2–7.

(14) "EARPHONE LEVEL" CONTROL, R411.—Potentiometer R411 is a front-panel control used to adjust the level of the receiver audio and the speech side-tone monitored at EARPHONES jack J401. The gain-control circuit is described in paragraph 2*b*(11), this section.

(15) "AVC" SWITCH, S102.—The operation and use of S102 is explained in paragraph 2*b*(2) of this section, in connection with the AVC circuit. This toggle switch is not a front-panel control, but is located atop the Radio Modulator chassis.

(16) "CLIP-FILT" SWITCH, S103.—The operation and use of S103 is explained in paragraphs 2*b*(1) and 2*b*(3) of this section, in connection with the clipper-filter circuits. This toggle switch is also located internally atop the Radio Modulator chassis.

(17) "VOL EXP" SWITCH, S104.—The operation and use of this switch is explained in paragraph 2*b*(5), this section. It is located within the Radio Modulator unit.

(18) CLIPPING SYMMETRY ADJUSTMENT, R113.—The clipping symmetry control, R113, is a rheostat in the clipper circuit of V103. The function of this adjustment is described in paragraph 2*b*(3), this section.

(19) MCW MODULATION LEVEL ADJUSTMENT, R141.—Potentiometer R141 is a gain control in the output circuit of the MCW oscillator and adjusts the level of the MCW audio voltage applied to the grid of the third audio amplifier, V104B; see figure 2–8. It is an interior screwdriver control adjustment on the top of the Radio Modulator chassis.

(20) MCW OSCILLATOR FREQUENCY ADJUSTMENT, C124.—C124 is a screwdriver-adjusted trimmer capacitor in the MCW-oscillator circuit (figure 2–8) and provides adjustment of the oscillator frequency over a limited range. It is located at the top of the Radio Modulator unit.

(21) MCW HOLD-TIME ADJUSTMENT; R131.—R131 is a variable resistor used to adjust the time-constant at the grid of carrier-control tube V110, as explained in paragraph 2*b*(9), this section. It is a screwdriver potentiometer located toward the rear of the Radio Modulator unit, near the modulator tubes.

(22) RELAY CIRCUITS.—Four relays are incorporated in the circuits of the Radio Transmitter: K101, the keying relay; K401, the carrier-control relay; K402, the equipment start-stop relay; and K403, the antenna change-over relay. In model AN/URT-7B, a fifth relay, K404, is added as a thermal cut-out relay.

The keying relay (K101) has two contact pairs; see figures 2-8, 7-28, 7-28A and 7-28B. One keys the MCW oscillator to provide MCW characters; the other simultaneously grounds the grid of the carrier-control tube V110 as required to keep the carrier on for such transmission (with the aid of a time-constant circuit). During phone transmission, only the second function is used.

Both K401, the carrier-control relay, and K403, the antenna change-over relay, are in the plate circuit of V110 and energize when V110 is made to conduct by operation of K101. The carrier-control relay applies B+ voltages in certain circuits, as required, to turn on the r-f carrier. The antenna relay merely transfers the antenna circuit from a receiver coaxial connection to the Radio Transmitter connection.

The start-stop relay, K402, energizes in response to operation of the front-panel START-STOP switch (S402), as described in paragraph 2*e*(2) of this section. K402 contacts, besides locking in K402, close the line input to power transformer T401, and to the ventilating blower, B601, in the Amplifier-Oscillator unit. On model AN/URT-7B, the contacts of thermal relay K404 are closed under normal operation conditions, but if the temperature of the relay exceeds normal, due to the loss of air flow, the relay contacts open and remove the power to relay K402 which stops the transmitter.

(23) MICROPHONE AND KEYING CIRCUITS, LOCAL OPERATION. (*See figure 2-9.*)—The voltage necessary to operate microphone and keying relay K101 is obtained from the negative 42-volt supply. This voltage is applied to one side of K101 in series with terminals 3 and 4 of T101, and to the microphone press-to-talk switch (when LOCAL-REMOTE switch S404 is in the LOCAL position). Terminals 1, 2, 3, and 4 of T101 identify the complete primary input winding. Each time the microphone press-to-talk switch is closed, current flows through this circuit energizing keying relay W101, which operates the carrier-control tube, V110. If a telegraph key is used instead of the microphone, the same series circuit is involved, except that the microphone press-to-talk switch is replaced by the key.

3. BLOWER.

Blower B601, consisting of an electric motor and a centrifugal-type fan, is mounted in a compartment at the rear of the Amplifier-Oscillator unit. This blower must operate whenever the equipment is in use, in order to protect the 4X150A tubes and maintain safe internal operating temperatures. A removable filter, located at the rear wall of the unit, cleans the air supply and minimizes fouling of the transmitter by dirt and other impurities in the air.

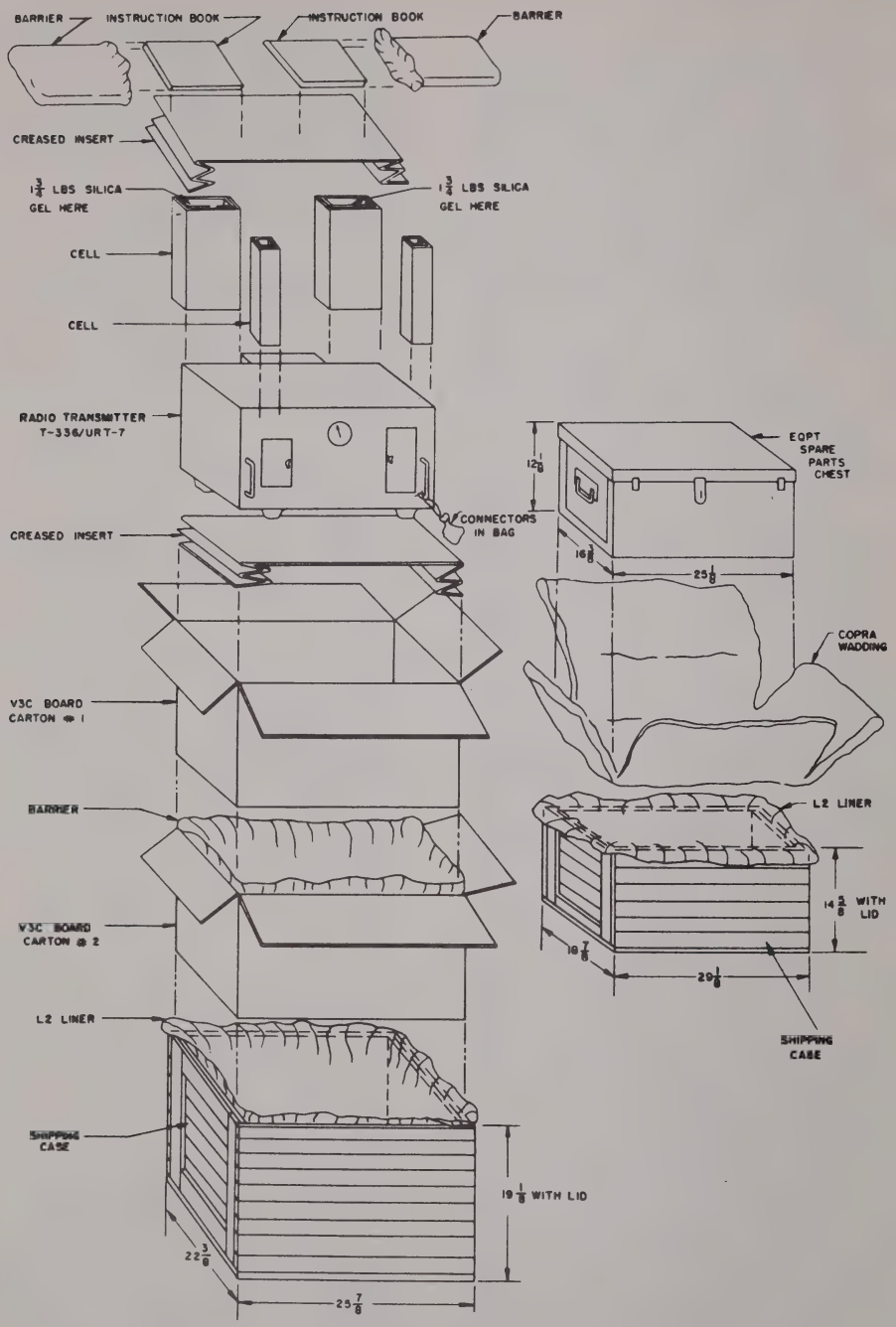


Figure 3–1. Radio Transmitting Set AN/URT-7, Method of Packing

SECTION 3
INSTALLATION

1. UNPACKING.

a. GENERAL.—Each complete Radio Transmitting Set AN/URT-7 is shipped in two wooden crates. Crate No. 1 contains the Radio Transmitter, while the equipment spart parts chest is packed in crate No 2. Cable Assemblies CX-1826/U, CX-1827/U, and CX-1828/U (shown in figure 1–1) are packed in the spare parts chest. The method of packing the equipment is illustrated in figure 3–1; refer to that drawing while unpacking in accordance with the following instructions.

b. UNPACKING RADIO TRANSMITTER T-336/URT-7.

(1) Set up the packing crate as designated by the markings on the outside.

(2) Remove the top of the crate using a nail puller.

CAUTION

Do not use a pinch bar or claw hammer to remove nails.

(3) Cut open the waterproof box liner.

(4) Open the outer cardboard carton and cut the moisture-vaporproof barrier between the outer and inner cartons. Open the inner cardboard carton.

(5) Lift out the instruction books, the creased cardboard insert, and the cardboard spacer cells.

(6) Carefully lift out the Radio Transmitter and place it on a convenient table or bench, as close to the final operating position as is practicable.

c. UNPACKING EQUIPMENT SPARE PARTS CHEST.

(1) Perform steps (1) through (3) of preceding paragraph 1*b*.

(2) Open the protective wadding and lift out the chest.

(3) Store the spare parts chest in the place designated by the Officer-in-Charge.

2. INSPECTION.

a. Radio Transmitter T-336/URT-7 is shipped completely assembled with all tubes and other components installed. Also, when the unit is shipped the terminal box is bolted to the rear of the cabinet.

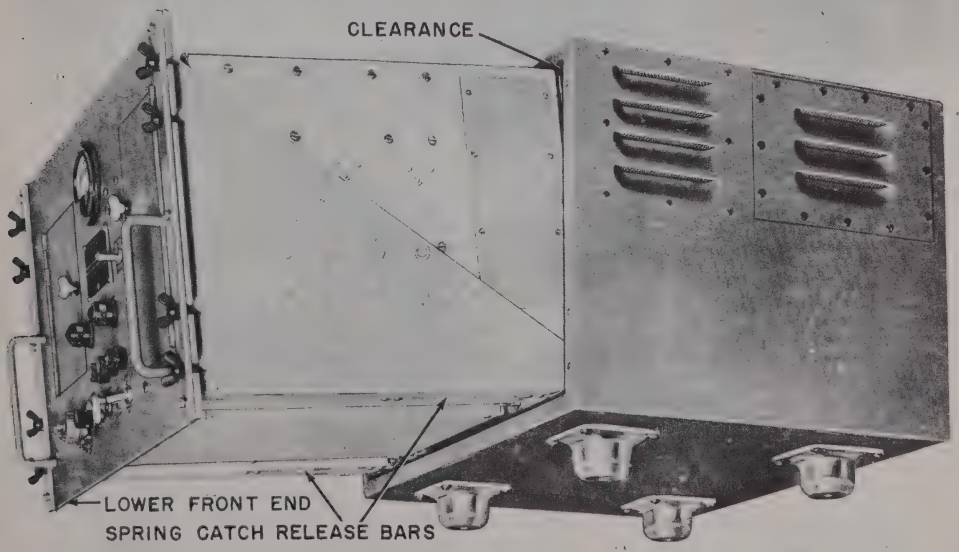


Figure 3—2. Method of Removing Main Chassis from Cabinet

b. Examine the equipment (including the spare parts chest) for evidence of damage which may have been incurred in shipment. Report any abnormality, as well as any which may be discovered in the procedures which follow, to the Officer-in-Charge.

c. Loosen the eight captive wingnuts on the front panel. Pull the main chassis out of the cabinet as far as the travel-limiting retainer locks permit.

CAUTION

The cable between the terminal box and the Power Supply chassis must be handled with care to avoid unnecessary strain on the wires. When the chassis is pulled part way out, the cable is accessible for disconnection.

d. Remove connector J501 from receptacle P403 at the rear of the front panel; see figure 1–2.

e. Reach under the main chassis and release the spring locks by exerting an upward pressure on the spring catch release bars; see figure 3–2. Carefully pull the chassis out as far as it will come.

CAUTION

When the chassis is withdrawn beyond the stops, the front end must be supported.

f. Disconnect the two coaxial cables from the front of the antenna change-over relay (K403); the cables are terminated by P501 (painted green) and P502 (painted red), respectively.

g. In order to remove the equipment from the cabinet, it is necessary to lift the rear end of the chassis so that the guide buttons come out of the slots. To accomplish this, tilt the chassis (see figure 3–2) so that the top rear portions of the assembly clear the cabinet. Then raise the chassis sufficiently to clear the guide buttons, without striking the cabinet top, and withdraw the chassis. Disconnect the coaxial cable, terminated by P602 (painted yellow), from the rear of the antenna relay.

h. Pull open the latches at the rear of the Amplifier-Oscillator and Radio Modulator units and remove those units from the main chassis; see figure 3–3. Remove the cover plates on the sides and top of the

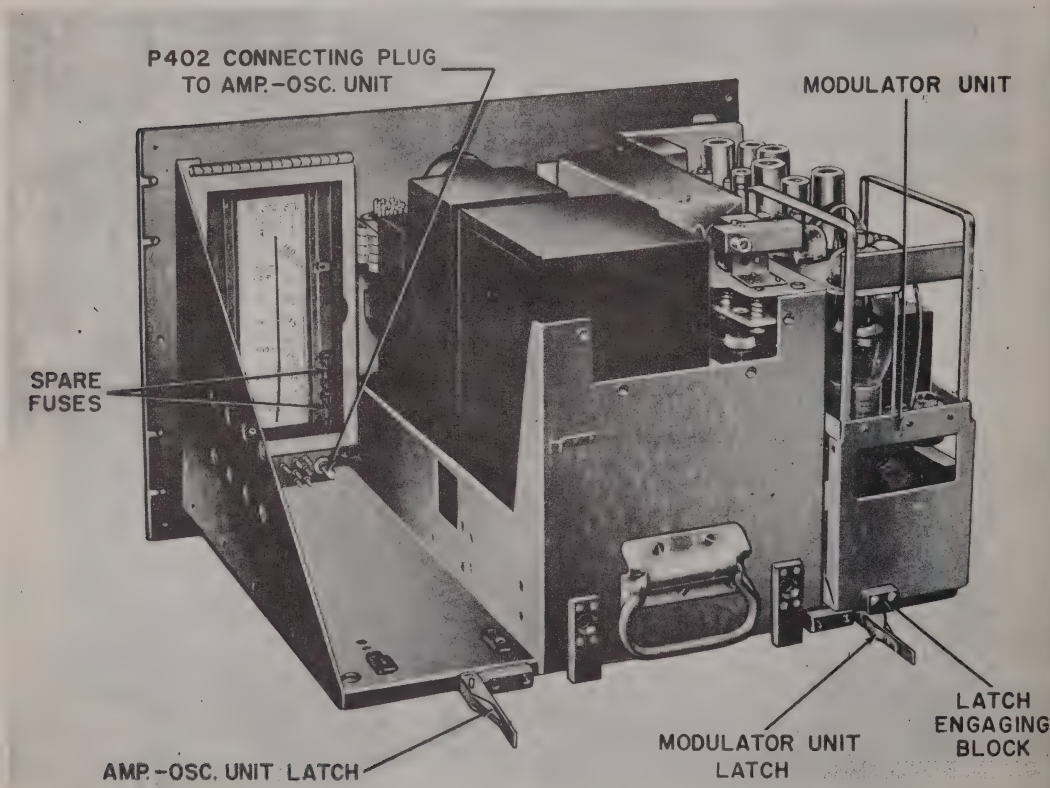


Figure 3–3. Method of Removing Amplifier-Oscillator and Radio Modulator Units from Main Chassis

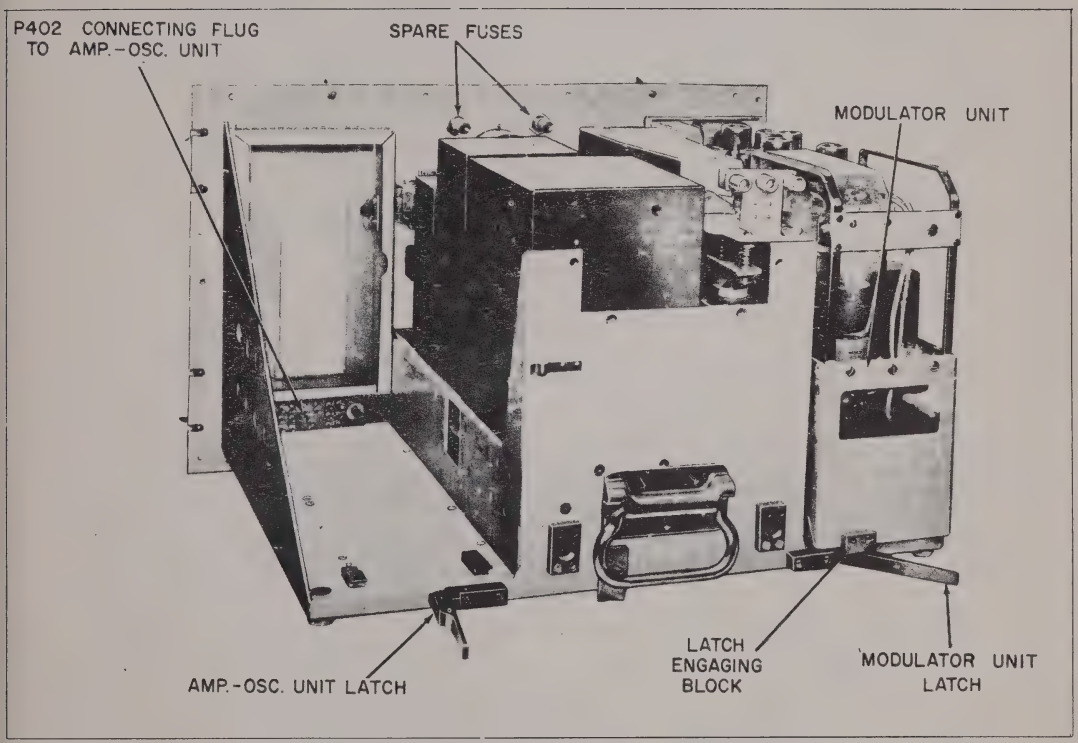


Figure 3—3A. Method of Removing Amplifier-Oscillator and Radio Modulator Units from Main Chassis for AN/URT-7B

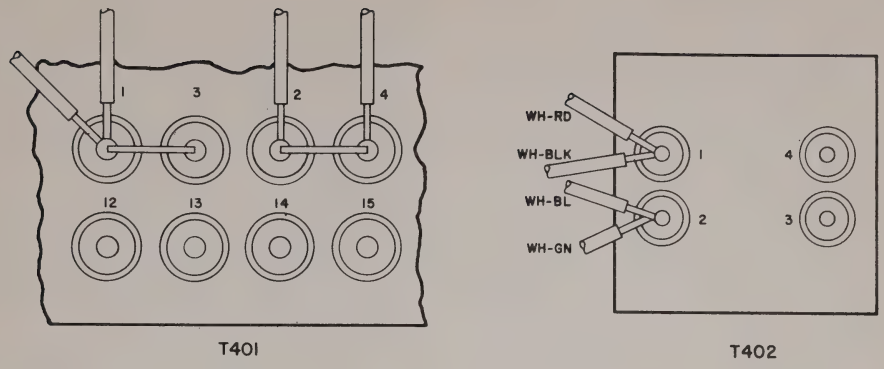


Figure 3—4. Transformer Connections for 115-Volt and 230-Volt Operation

Amplifier-Oscillator and the plate on the right side of the blower compartment. Also remove the bottom plate of the Power Supply chassis.

i. Inspect each unit carefully. Check each component for damage, particularly the tubes, relays, and selenium rectifiers. All moving parts, including relays, tuning controls, switches, and potentiometers, should be checked for free movement. Check the operation of the locking knobs on the r-f tuning controls (B, C, and D), as well as those on the SP AMP and MOD controls. Inspect each tube individually to ascertain that it is properly seated in its socket.

j. Replace the cover plates previously removed from the Amplifier-Oscillator. If the equipment has not been used before and is to be operated from a 115-volt power source, replace the bottom plate on the Power Supply chassis. However, if a 230-volt source is to be utilized, or if the equipment has been used, check the transformer wiring specified in paragraph 3 of this section before replacing the bottom plate.

k. Place the AVC, VOL EXP, and CLIP-FILT switches, located at the top of the Radio Modulator chassis, in their ON positions.

l. Replace the Amplifier-Oscillator and Radio Modulator units on the main chassis. Do *not* replace the chassis in the cabinet until after the equipment has been installed in accordance with the instructions of paragraph 5, this section. (If relay-rack mounting is employed, the cabinet may be stored.)

3. TRANSFORMER CONNECTIONS FOR 115-VOLT OR 230-VOLT POWER SOURCE.

The Radio Transmitter, as shipped from the factory, is wired for operation from a 115-volt, 50/60-cycle power source. If operation from that primary voltage is to be employed, and the equipment has not been used, proceed to the instructions of paragraph 4.

However, if the equipment has been previously used or if 230-volt operation is contemplated, it is necessary to check and possibly change the primary connections of transformers T401 and T402. The terminal connections of these transformers, accessible when the bottom plate is removed from the Power Supply chassis, are shown in figure 3–4. Carefully inspect the terminal wiring, making changes as required to insure that the connections are proper for the line voltage to be used.

4. LOCATION OF EQUIPMENT.

a. Under conditions of normal installation and operation, the Radio Transmitter will not interact with other communications equipment. To assure satisfactory operation in areas of extreme electrical interference, particular care should be exercised to assure the adequate bonding to ground of all units.

b. To assure optimum performance, the equipment should be located so as to permit connection to auxiliary equipment with the shortest possible lead lengths. Refer to figure 3–5 for all special wiring instructions.

c. The Radio Transmitter should be so located that the ambient temperature will remain within the limits of –20° C. to +50° C. (–4° F. to +122° F.).

d. It is also desirable that the equipment be so located as to permit tuning adjustments to be made and minor repairs accomplished, without removal of the chassis from the cabinet.

e. If a remote-control unit is used, it may be located at any convenient place subject only to the wiring restrictions detailed in figure 3–5.

5. MOUNTING THE EQUIPMENT

a. RADIO TRANSMITTER T-336/URT-7.—The Radio Transmitter may be mounted, in the cabinet supplied, on any rigid table, desk, shelf, or suitable flat surface. Alternatively, it may be mounted in a standard 19-inch relay rack without the cabinet.

CAUTION

The Radio Transmitter must be mounted with a minimum clearance of three inches on each side to allow for free circulation of cooling air.

(1) CABINET MOUNTING.—Mounting clearances and drilling templates for mounting the cabinet on a flat supporting surface are shown in figure 3–5. When mounted within three inches of the mounting-surface front edge, as in most installations, the four supports should be removed and the cabinet mounted directly on the mounting surface. The mounting bolts are not supplied as part of the equipment and must be procured locally. The four mounting supports must be used whenever the equipment is being mounted back from the front edge of the mounting surface. Their use is required to obtain the clearance necessary for removal of the chassis.

The terminal box may be mounted in any one of the three positions indicated in figure 3–5, depending on available clearances and wiring facilities. Figure 3–6 shows the box mounted on the rear wall of the cabinet and also indicates the two alternative side positions.

After securing the cabinet to the mounting surface reinstall the main chassis, being careful to engage the guide buttons. Before sliding the chassis completely into the cabinet, connect the multiconductor cable to the Power Supply connector on the rear of the front panel and the coaxial cables to the antenna relay. Be certain to match the connector colors to those on the relay. After the cables are connected slide the chassis in and tighten the wingnuts on the front panel.

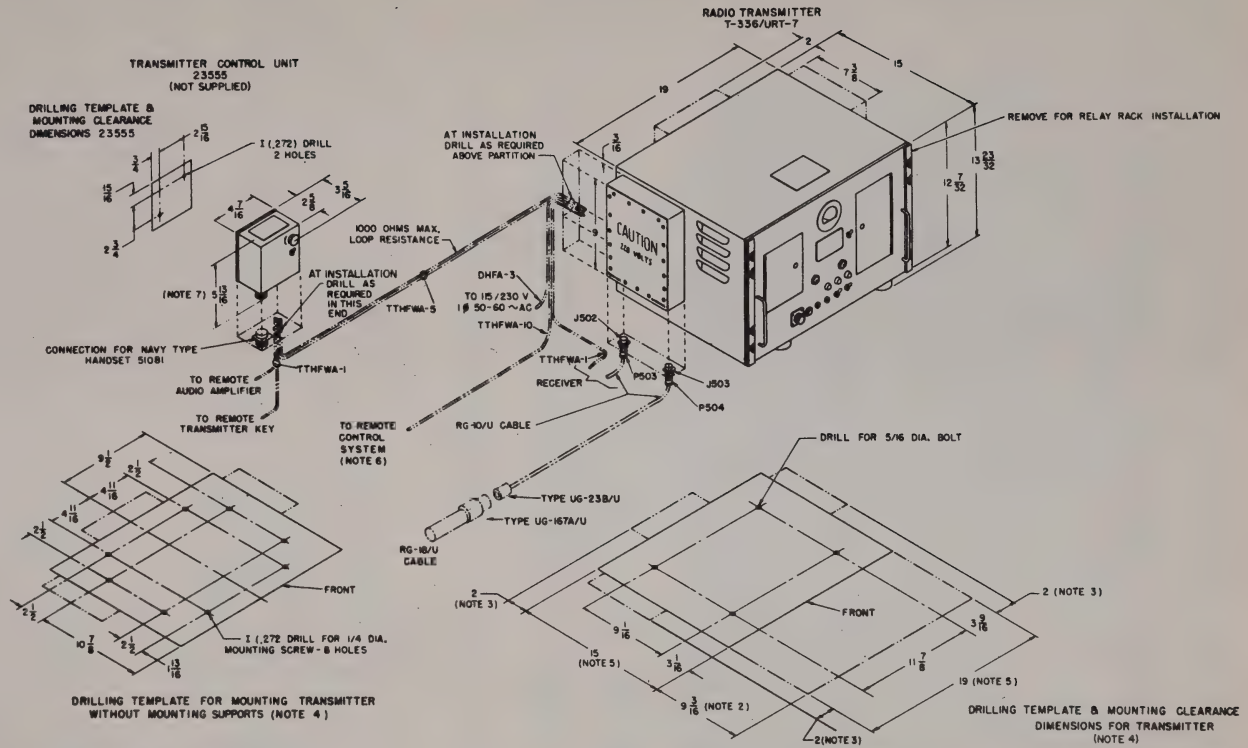
CAUTION

When inserting the chassis in the cabinet, lay the power cable in the space immediately to the right of the caution plate atop the Power Supply (see figure 1–2) and pull the cable forward as the chassis is pushed into the cabinet. The cable must not be pinched behind the chassis.

(2) RACK MOUNTING.—For mounting the equipment in a 19-inch relay rack, refer to figure 3–7; the complete procedure is outlined in the notes thereon. Note that it is necesary to remove the six screws securing the two vertical strips to the side edges of the face of the front panel. This will make available the eight slots required to rack-mount the unit. When mounted in a relay rack, the terminal box must be attached to the back of the main chasis, using the four tapped studs (A403), which are packed in the spare parts chest.

b. REMOTE-CONTROL UNITS.—If a Transmitter Control Navy Type -23555 (figure 3–8) is used for remote operation, it is to be installed as indicated in figure 3–5. After drilling the mounting surface as shown, remove the back plate and bolt to the drilled surface. Make all the necessary connections to the terminal board before securing the remainder of the control unit to the back plate.

If a Remote Radiophone Unit Navy Type -23500 is used, it should be installed in accordance with the instruction book and/or installation drawings accompanying it, following the latest standard Navy procedure.



NOTES: 1. EQUIPMENT SHOWN IN PHANTOM NOT SUPPLIED WITH RADIO TRANSMITTING SET

2. FRONT CLEARANCE REQUIRED TO SERVICE CHASSIS IN CABINET. 20" FRONT CLEARANCE IS REQUIRED TO PERMIT REMOVING THE CHASSIS FROM THE CABINET.

3. TERMINAL HOUSING ASSEMBLY FRL-2285Z-1 MAY BE MOUNTED IN ANY ONE OF 3 POSITIONS SHOWN.

4. EQUIPMENT SHOULD BE MOUNTED WITHOUT SUPPORTS IF FRONT EDGE OF SHELF IS NOT MORE THAN 3" FROM FRONT PANEL. OTHERWISE USE TEMPLATE FOR MOUNTING WITH SUPPORTS.

5. MINIMUM OF 3" CLEARANCE, MEASURED FROM CABINET LOUVERS TO ADJACENT WALL, IS REQUIRED ON BACK AND EACH SIDE FOR SUFFICIENT AIR CIRCULATION.

6. NAVY STANDARD RADIOPHONE UNITS 23500 OR EQUIVALENT. CONNECT TERMINALS 1 TO 14 IN TRANSMITTER TO CORRESPONDING TERMINALS IN RADIOPHONE UNITS.

7. MAINTAIN SUFFICIENT CLEARANCE FOR 510B! HANDSET PLUG.

8. AMBIENT OPERATING TEMPERATURES −20°C TO +50°C. HEAT DISSIPATION 700 W.

Figure 3–5. Radio Transmitting Set AN/URT-7, Installation Drawing

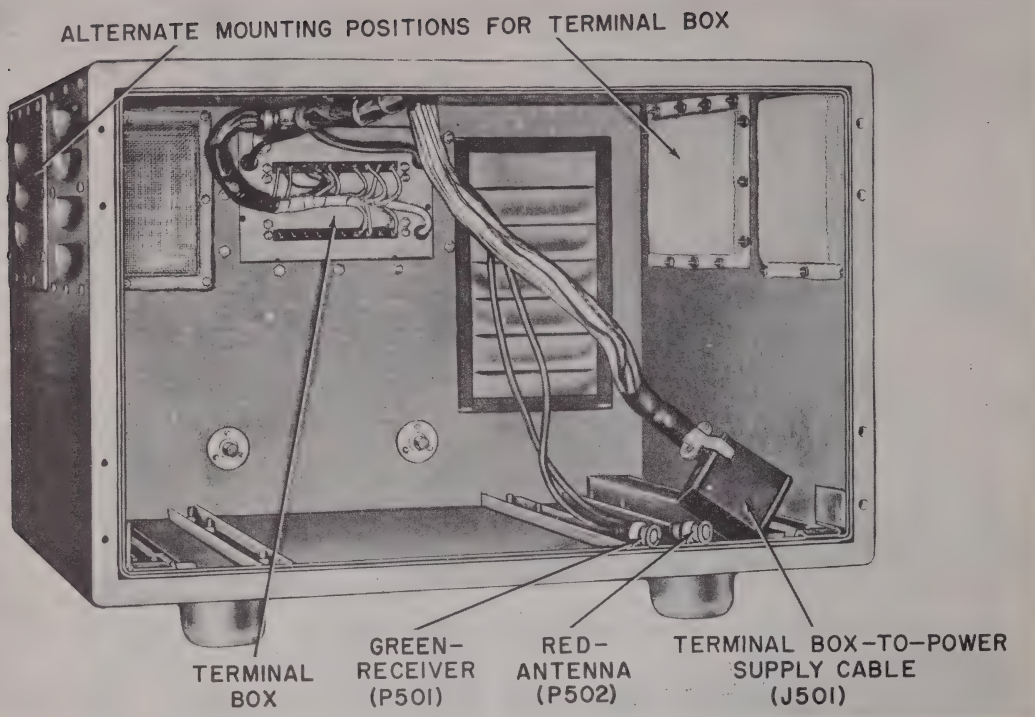


Figure 3–6. Electrical Equipment Cabinet CY-1126/URT, Main Chassis Removed

6. GROUNDING THE EQUIPMENT.

To assure satisfactory operation in areas of extreme electrical interference, particular care should be taken to assure adequate bonding of the equipment to ground. Ground the equipment in accordance with standard Navy procedures for electronic equipment. Since the Radio Transmitter operates from an alternating-current source, it may be bonded to ground without regard to the ground characteristics of the power source used.

7. ANTENNA.

At the time of preparation of this instruction book, the only specific antenna designated for use with Radio Transmitting Set AN/URT-7 was Antenna Assembly Navy Type -66095; see figure 3–9. This antenna is a fixed, vertically polarized, half-wave dipole and consists of the vertical dipole elements attached to a horizontal supporting transmission-line section. It is connected to the Radio Transmitter by means of 50-ohm coaxial cable.

A mounting clamp is provided to attach the antenna support securely to the mounting surface. When mounted in position, the dipoles are approximately two feet from the mounting structure and extend about two feet above and below the antenna support. Electrical connection to the antenna conductor is made at the mounting end of the antenna-support tube by means of a standard Navy-type transmission-line connector. No adjustments of the Antenna Assembly are required.

Bolt the mounting base plate to the selected location in such manner that the antenna-supporting tube lies in a horizontal position.

Place the base end of the antenna-support tube in the concave section of the mounting plate, with the antenna-support tube in a horizontal position and the dipoles in a vertical position; the insulated radiator should be uppermost. Place the mounting clamp over the base end of the antenna-support tube, then insert and tighten the four retaining cap-screws. The position of the antenna-support tube may be changed through a maximum of 2⅛ inches by slipping it through the mounting clamp before the cap-screws are made secure.

NOTES

TO CHANGE OVER THE TRANSMITTER FROM CABINET MOUNTING TO STANDARD 19" RELAY RACK MOUNTING, FOLLOW THE PROCEDURE AS OUTLINED BELOW.-

a. WITHDRAW TRANSMITTER FROM CABINET, DISCONNECT POWER PLUG ON REAR OF FRONT PANEL AND TWO BNC CONNECTORS ON ANTENNA CHANGE-OVER RELAY.

b. TAKE TRANSMITTER OUT OF CABINET.

c. REMOVE THE TWO CAPTIVE SCREW STRIPS FROM EITHER SIDE OF THE FRONT PANEL EXPOSING SLOTS.

d. REMOVE COVER FROM TERMINAL HOUSING ON THE CABINET. THIS EXPOSES THE SCREWS THAT HOLD THE TERMINAL HOUSING TO THE CABINET. REMOVE THESE SCREWS AND TWO CABLE CLAMPS ON INNER TOP OF CABINET WHICH HOLDS THE POWER CORD IN PLACE. TAKE THE TERMINAL HOUSING OFF THE CABINET.

e. OBTAIN 4 TAPPED SPACERS, A403, FROM THE EQUIPMENT SPARE PARTS BOX AND SCREW THEM INTO THE 4 TAPPED INSERTS ON THE UPPER REAR CENTER OF THE TRANSMITTER.

f. USING FOUR OF THE SAME SCREWS & LOCKWASHERS THAT HELD THE TERMINAL HOUSING TO THE CABINET, ATTACH THE TERMINAL HOUSING TO THE TAPPED SPACERS.

g. PLUG IN THE POWER CORD & BNC CONNECTORS.

h. ATTACH TRANSMITTER TO RELAY RACK WITH 8 #12-24 SCREWS.

i. DRILL HOLE IN ANY SIDE OF TERMINAL HOUSING BEST SUITED FOR EXTERNAL SUPPLY & BRING IN LEADS TO TERMINAL BLOCK.

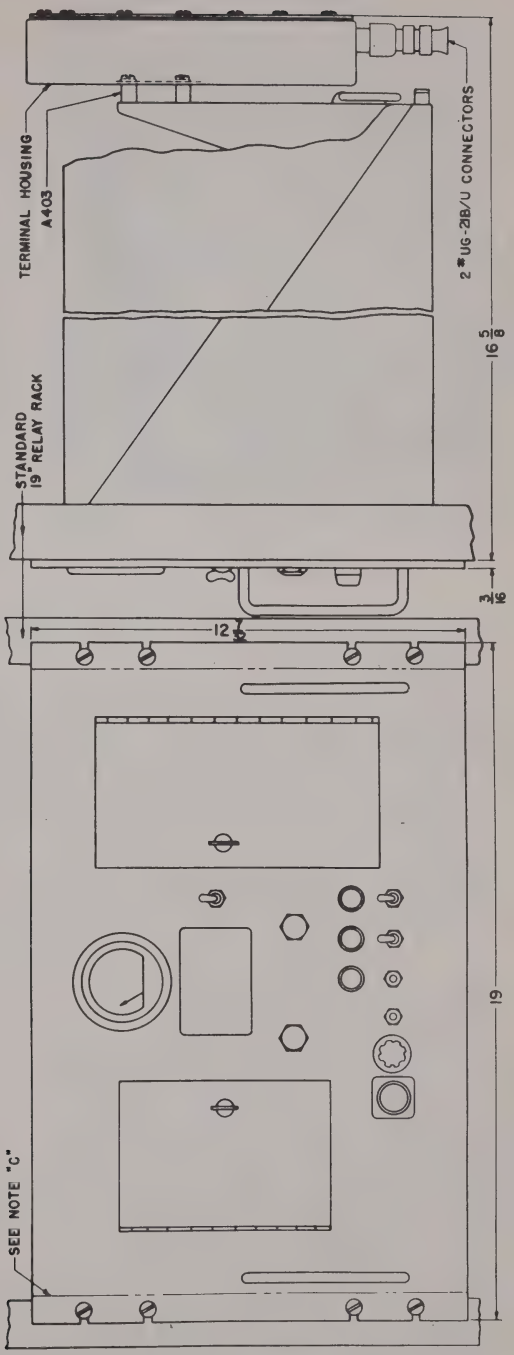


Figure 3–7. Radio Transmitter T-336/URT-7, Installation for Relay-Rack Mounting

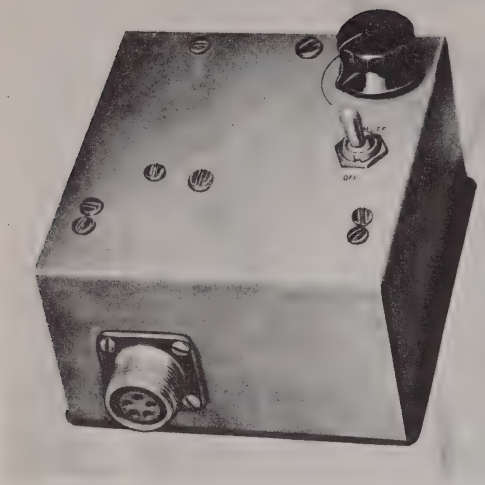


Figure 3–8. Transmitter Control Navy Type -23555

8. INTERCONNECTIONS AND INSTALLATION OF CABLES.

a. CABLING AND CONNECTORS SUPPLIED.—No external cables are furnished with the equipment, other than the three special-purpose cable assemblies (W301, W302, and W303) provided for testing the Radio Transmitter units when disassembled from each other or from the cabinet. However, all connectors needed for the fabrication of cables to units of the equipment and for connections to auxiliary equipment are supplied; these connectors are shipped in a cloth bag tied to the front panel.

Note

The latest Bureau of Ships installation plans should be consulted before proceeding.

b. INTERCONNECTING WIRING.—All interconnections between the Radio Transmitter and auxiliary units are terminated at the terminal box (figure 3–10) mounted on the cabinet, or at the rear of the main chassis, if the equipment is rack-mounted. Except for the antenna transmission line and the coaxial cable leading to the receiver antenna terminal, all interconnection wiring is shown in figure 3–11. If the Type -23500 Radiophone Unit is not used, the audio-output terminals of the receiver should be connected directly to terminals 13 and 14 of E502, in the Radio Transmitter terminal box.

The coaxial cables between the terminal box and the antenna, and between the terminal box and the receiver antenna input, are indicated in figure 3–5. Instructions for assembling the connectors to the cables appear in subparagraphs *c* and *d*, which follow.

Note

Although type UG-21B/U connectors are furnished for installing the equipment using RG-8/U or RG-9/U cable, the installation may be made with RG-18/U cable and UG-167A/U or UG-167B/U connectors.

The assembly of type BNC connectors to coaxial cable is described in subparagraph *e*, below. Connectors of this type are used on the coaxial cables *within* the equipment; no assembly need be performed during installation of the equipment. However, the assembly instructions are included at this point in order to group such information at one place in this instruction book.

c. ASSEMBLY OF TYPE UG-21B/U PLUG CONNECTOR TO CABLE. *(See figure 3–12.)*

(1) Cut cable off sharply. Cut off vinyl jacket 1/2 inch from end, being careful not to nick braid.

(2) Fan out copper braid. Cut inner dielectric

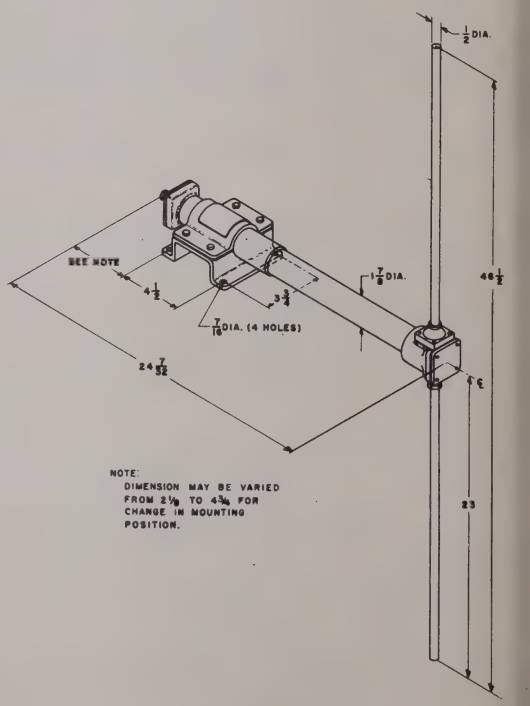


Figure 3–9. Antenna Assembly Navy Type -66095

1/4 inch from end to bare center conductor; be careful not to nick conductor.

(3) Taper braid over end of cable. Slide nut, washer, and gasket onto vinyl jacket. Slide clamp onto braid.

(4) With clamp in place, trim braid 1/16 inch back from end of center conductor so that length of exposed braid is 3/16 inch.

(5) Fold braid back on clamp. Tin center conductor of cable, using minimum amount of heat to prevent damage to dielectric.

(6) Holding contact with pliers, solder contact to center conductor of cable. Back end of contact must be flush with polyethylene dielectric. Do not use excess of solder and wipe cable and contact clean after soldering.

(7) Slide body into place so that center conductor contact enters hole in insulator. Face of cable dielectric must fit flush against insulator. Tighten body and nut with wrenches, exercising care not to damage connector.

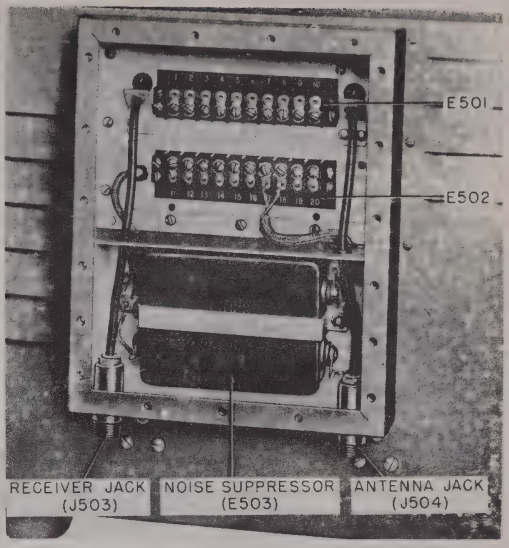
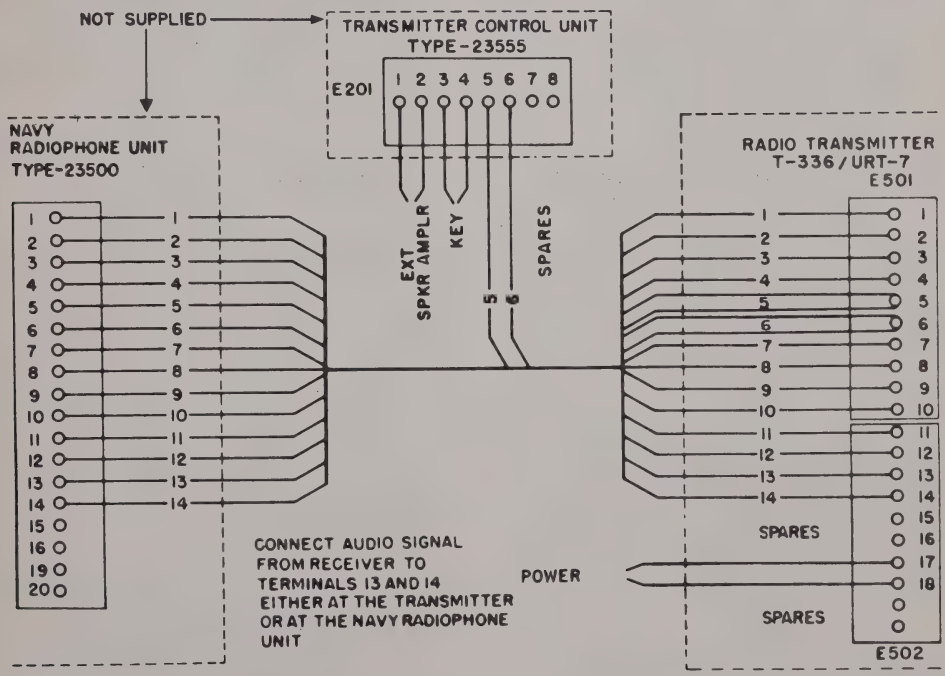


Figure 3—10. Terminal Box, Cover Removed



NOTE: FOR USE WITH TYPE SGC-1A KEYER DO NOT MAKE CONNECTION TO TERMINAL 12 OF TRANSMITTER.

Figure 3—11. Radio Transmitting Set AN/URT-7, Interconnection Wiring Diagram

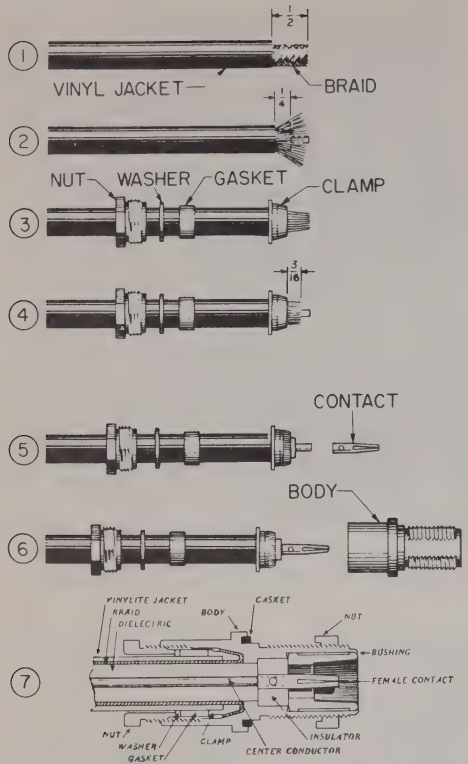


Figure 3—12. Assembly of Type UG-21B/U Plug Connector to Cable

d. ASSEMBLY OF TYPE UG-167A U PLUG CONNECTOR TO CABLE. *(See figure 3–13.)*

(1) Cut RG-18/U cable sharply and squarely to correct length and slide nut over end of cable. Starting at a point 7/8 inch from end of cable, carefully cut through armor braid and down to vinyl jacket. Do not cut jacket.

(2) Turn out radially 1/8 inch of armor braid against end of nut. Slide washer and gasket over end of cable against turned-out armor. At a point exactly 5/8 inch from end of cable, carefully cut sharply and squarely through vinyl jacket and down to outer connector braid. Do not nick this braid. Slide clamp over end of cable and against face of gasket.

Note

The end of the vinyl jacket will not fit snugly against the internal shoulder of the clamp when the gasket is in a released position. Allowance has been made for the vinyl jacket to fit snugly against this shoulder of the clamp when the nut is tightened into the body.

(3) Fan braid back over tapered shoulder of clamp, cutting off excess strands at flange. At a point 3/16 inch from point where braid fans back over clamp, cut sharply and squarely through polyethylene dielectric and down to inner conductor, being careful not to nick, bend, or otherwise damage inner conductor. Cut off end of inner conductor sharply and squarely 3/16 inch (maximum) from end of dielectric and taper slightly to mate easily with male contact. Tin end of conductor and hole in end of contact. Solder contact to inner conductor, making sure that contact is flush with and perpendicular to end of dielectric.

(4) Push body (with coupling nut attached) onto end of cable as far as possible. From other side, tighten nut into body.

e. ASSEMBLY OF TYPE BNC CONNECTOR TO CABLE. *(See figure 3–14.)*

(1) Cut cable off sharply. Slide nut over cable. Cut off jacket 1/2 inch from end, being careful not to nick braid.

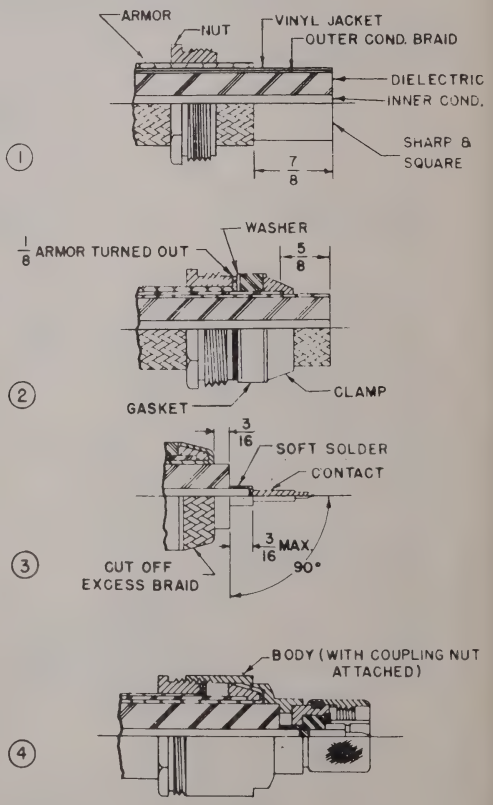


Figure 3—13. Assembly of Type UG-167A/U Plug Connector to Cable

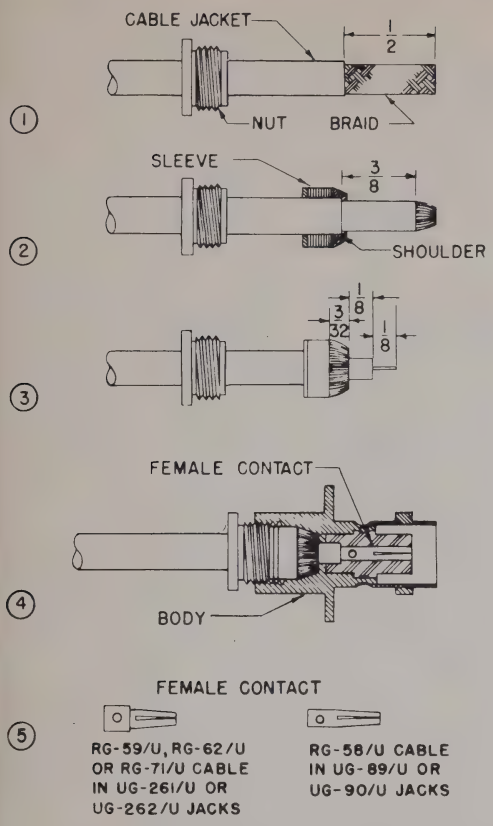


Figure 3—14. Assembly of Type BNC Connector to Cable

(2) Cut off inner insulation and wire under braid 3/8 inch from end of jacket; taper braid and slide sleeve onto cable. Inner shoulder of sleeve must fit squarely against end of cable jacket.

(3) With sleeve in place, comb out braid; fold back smooth and trim to 3/32 inch from end. Cut inner dielectric 1/8 inch from braid, being careful not to nick inner conductor, and cut off inner conductor 1/8 inch from end of dielectric.

(4) Tin inside hole of contact and center conductor of cable. Then slip female contact in place and solder; remove excess solder. Be sure cable dielectric is not heated excessively and swollen, so as to prevent dielectric entering body. Push dielectric into body as far possible; then slide nut into body and screw into place with a wrench until moderately tight. Hold cable and shell rigidly and rotate nut.

Note

This assembly procedure applies to BNC jacks. The assembly for plugs is the same except for the use of male contacts and a plug body. Two types of female contacts may be used with the BNC jack.

f. CARE OF CABLES.—Cables should be run so that they will be protected from damage. Care should be taken that the cables at no time are pressed against sharp edges or subjected to excessive pressure or bends. Each cable should be mechanically supported at frequent intervals throughout its length.

9. CHECKING INSTALLATION AND OPERATION OF EQUIPMENT.

After the installation has been completed, check all connections and wiring between units to ascertain that no errors have been made. When it is certain that the installation has been properly accomplished, check the operation of the equipment, as follows:

a. Check that the three internal Radio Modulator switches (AVC, VOL EXP, and CLIP-FILT) are all ON; refer to paragraph 2*k*, this section.

b. Place the equipment in operation, as outlined in Section 4, paragraph 2. Functions of the operating controls are discussed in paragraphs 1*b* and 3 of that section. Check the operation by comparing the values obtained on the panel meter with the typical readings included on the OPERATING INSTRUCTIONS chart located on the inside of the left front-panel access door. If any reading is appreciably different from the normal value, refer to Section 7 for corrective measures.

Note

Do not leave the METER switch set to the AVC position after checking the AVC meter reading, since the meter circuit impairs operation of the AVC circuit. The switch should remain in one of the other positions.

c. If remote operation is to be used, check such operation by following the applicable instructions of Section 4, paragraph 4.

SECTION 4
OPERATION

1. INTRODUCTION.

a. DESCRIPTION OF USE.—Radio Transmitting Set AN/URT-7 is employed for short-range communication by either radiotelephone or MCW operation. The equipment may be operated locally or remotely; remote-control units to be used for remote operation are not supplied with the equipment, but may be furnished separately by the cognizant supply office. In general, operation from a remote location consists of turning the equipment on and off (as permitted by the type of control unit in use), and using either a microphone or handset for voice transmission or a telegraph key for MCW transmission. Operation at the actual site of the Radio Transmitter includes additional procedures, such as changing frequency of operation, tuning, monitoring meter readings, etc., as required in tactical use of the equipment.

b. OPERATING CONTROLS, JACKS, AND INDICATORS.—All controls normally used by operating personnel are located externally on the front of the equipment, or within front access doors. No internal adjustments or settings should be attempted by the operator, other than those that may be indicated in paragraph 3 of this section, or in Section 5. The various front-panel controls, jacks, and indicators are shown in figure 4–1, and are as follows:

(1) "POWER ON - EMERGENCY OFF" SWITCH.—This toggle switch is the main power switch which opens both sides of the input power line feeding primary power to the equipment. This function cannot be controlled from a remote point, regardless of the setting of the LOCAL-REMOTE switch.

(2) "START-STOP" SWITCH.—This control is a nonlocking toggle switch which is used to turn the Radio Transmitter on (locally) with a momentary operation. This does not turn on the carrier, but merely readies the equipment for transmission.

(3) "POWER" INDICATOR LAMP.—This red-lensed lamp indicates that power is on and the transmitter is ready for use, when both the POWER ON-EMERGENCY OFF and START-STOP switches have been operated to turn the equipment on.

(4) "CARRIER TEST" SWITCH.—This toggle switch may be used to turn the carrier on locally for test or adjustment purposes. It may be actuated momentarily by depressing it downward, in which direction it is nonlocking, or it may be snapped upward to a locking position, if the operator desires to leave the carrier on and have both hands free for other adjustments.

(5) "CARRIER" INDICATOR LAMP.—This green-lensed lamp indicates that the transmitter carrier is on, either through manipulation of the CARRIER TEST switch or with voice or MCW transmission in normal use.

(6) "LOCAL-REMOTE" SWITCH.—Manipulation of this rotary switch transfers some operating control functions from the Radio Transmitter to a remote-control unit, or vice versa. The particular functions transferred depend upon the limitations of the remote-control unit used.

(7) "MCW-PHONE" SWITCH.—This rotary switch is used to switch the equipment from radiotelephone operation to MCW telegraph operation, or vice versa. When MCW is used, a telegraph key is substituted for the microphone at the MICROPHONE jack.

(8) "METER" SWITCH AND METER.—The rotary METER switch is used to connect the single front-panel meter into various circuits for measuring pertinent operating voltages and currents. The various circuits involved and the values measured are designated on the panel in the corresponding switch position.

Note

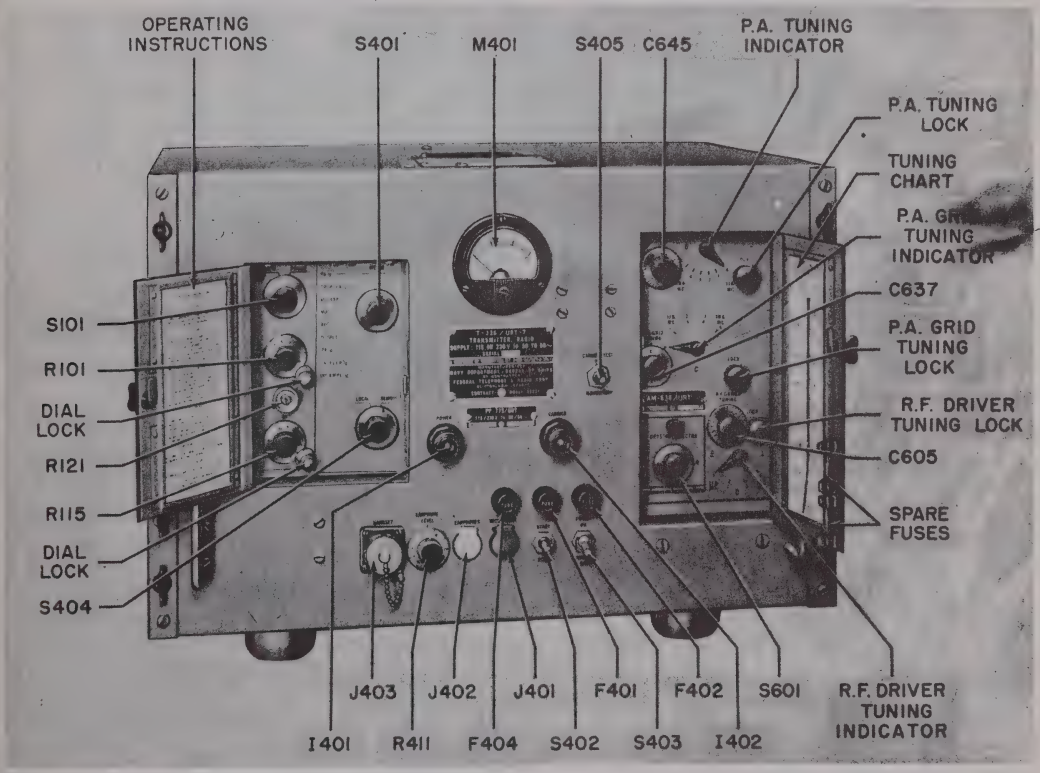
Do not leave the METER switch set to the AVC position except to check AVC operation, since the meter circuit impairs AVC action. The switch should be set to the OUTPUT position during normal operation.

(9) "CRYSTAL SELECTOR" SWITCH (A).—This rotary, turret-type switch provides a selection of any one of four crystals which correspond to four frequency channels that are available. By replacing the crystals with other frequency crystals, other channels may be substituted, as required. However, no more than four crystals can be set up in the switch holder at any one time, and only one crystal (for one transmitting frequency) can be used at any one time.

(10) "R.F. DRIVER TUNING" CONTROL (B).—This dial is used to tune the driver stages of the Amplifier-Oscillator unit. The complete control comprises a main indicator pointer with a scale (marked on the front panel) from 0 to 5 over a 180-degree arc, and a control knob with a dial for interpolating between main scale graduations. A tuning

setting consists of a three-digit figure, with the first digit obtained from the main indicator and the last two from the tuning dial. The dial on the control knob travels through 360 degrees (one complete turn) for a movement of the indicator over two main graduated intervals. Therefore, the dial is graduated between 0 and 9 twice, each occupying 180 degrees, so that each full graduation from 0 to 9 corresponds to one interval on the main panel graduation. Thus, if the indicator were between 3 and 4, and the dial were at 65, the control setting would be 365. Similarly, with the indicator between 0 and 1, and the dial at 65, the reading would be 065. A knob-type rotary tuning lock is provided to lock the control after it has been set.

(11) "P.A. GRID TUNING" CONTROL (C). —The control, as its name indicates, is used to tune the power-amplifier grid tank; it also tunes the output-filter network. It consists of a main indicator, a graduated dial, and a locking knob, and is similar to the R.F. DRIVER TUNING control described in subparagraph (10), above. The important difference

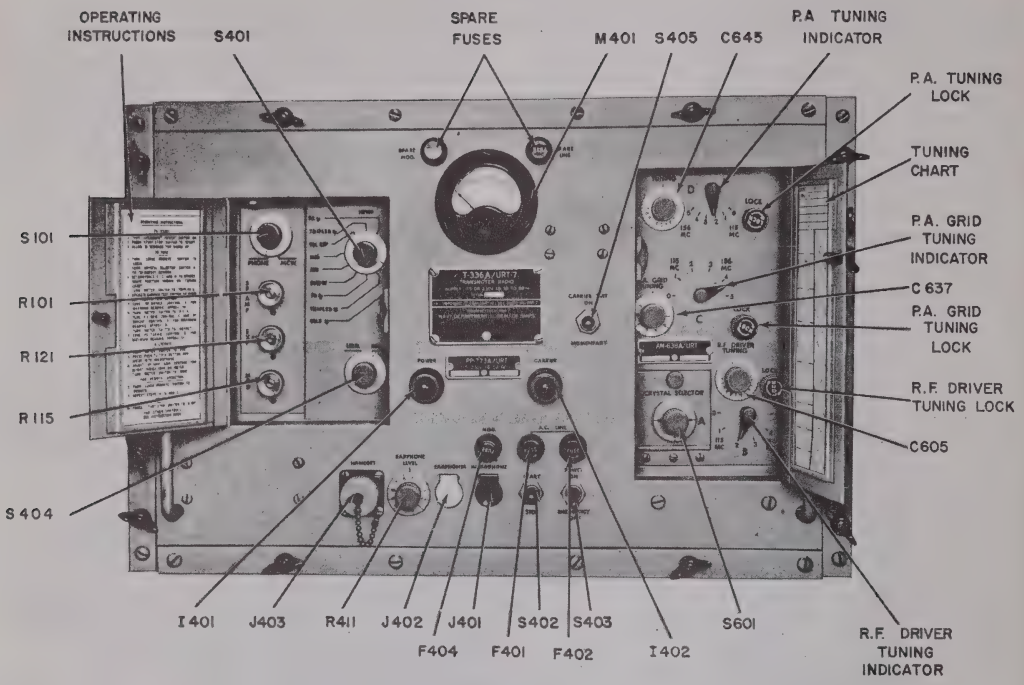


LEGEND

C605	R.F. DRIVER TUNING Control (B)	M401	Meter
C637	P.A. GRID TUNING Control (C)	R101	SP AMP Gain Control
C645	P.A. TUNING Control (D)	R115	MOD Level Control
F401	Line FUSE	R121	EXP Level Control
F402	Line FUSE	R411	EARPHONE LEVEL Control
F404	Modulator Plate FUSE	S101	MCW-PHONE Switch
I401	POWER Indicator Lamp	S401	METER Switch
I402	CARRIER Indicator Lamp	S402	START-STOP Switch
J401	MICROPHONE Jack	S403	POWER ON-EMERGENCY OFF Switch
J402	EARPHONES Jack	S404	LOCAL-REMOTE Switch
J403	HANDSET Jack	S405	CARRIER TEST Switch

S601 CRYSTAL SELECTOR Switch (A)

Figure 4—1. Radio Transmitter T-336/URT-7, Operating Controls



LEGEND

C605	R.F. DRIVER TUNING Control (B)	M401	Meter
C637	P.A. GRID TUNING Control (C)	R101	SP AMP Gain Control
C645	P.A. TUNING Control (D)	R115	MOD Level Control
F401	Line FUSE	R121	EXP Level Control
F402	Line FUSE	R411	EARPHONE LEVEL Control
F404	Modulator Plate FUSE	S101	MCW-PHONE Switch
I401	POWER Indicator Lamp	S401	METER Switch
I402	CARRIER Indicator Lamp	S402	START-STOP Switch
J401	MICROPHONE Jack	S403	POWER ON-EMERGENCY OFF Switch
J402	EARPHONES Jack	S404	LOCAL-REMOTE Switch
J403	HANDSET Jack	S405	CARRIER TEST Switch
		S601	CRYSTAL SELECTOR Switch (A)

Figure 4—1A. Radio Transmitter T-336A/URT-7, Operating Controls

is in the graduation of the tuning dial, whose scale of 0 to 9 covers the entire 360 degrees; rotating the dial completely corresponds to an indicator movement over one main scale interval. The dial and indicator are read in exactly the same manner as the R.F. DRIVER TUNING control.

(12) "P.A. TUNING" CONTROL (D).—The P.A. TUNING control drives the tuning capacitor in the power-amplifier plate circuit, tuning that tank. Except for the fact that the main indicator scale, graduated between 0 and 5, covers only 90 degrees of rotation, the control is identical to that of the R.F. DRIVER TUNING.

(13) "MOD" CONTROL.—The MOD control is a gain control used to adjust the level of speech modulation in the Radio Transmitter. Note the dial lock.

(14) "SP AMP" CONTROL.—The SP AMP control varies the input level to the speech-amplifier (first audio) stage. Note the dial lock.

(15) "EXP" CONTROL.—This control is used to adjust the level at which the volume-expander circuit operates; that is, the level of speech signal which must be fed into the microphone before the audio circuits respond. The volume-expander circuit eliminates unwanted background noise that would otherwise be transmitted between pauses in speech. Note that this is a locking screwdriver adjustment not subject to frequent change.

(16) "EARPHONE LEVEL" CONTROL.—This gain control, as indicated by its designation, controls the level of the audio signal available at the EARPHONES jack.

(17) "EARPHONES" JACK.—This jack provides the facility for monitoring speech side-tone or the audio from the receiver used in association with the Radio Transmitter.

(18) "HANDSET" JACK.—This five-pin connector is utilized for the connection of the local telephone handset.

(19) "MICROPHONE" JACK.—When local operation is utilized, the microphone (for 'phone transmission) or the key (for MCW transmission) is plugged into this jack.

c. CONDITIONS OF OPERATION.—The Radio Transmitter is relatively simple to operate, although slight variations from the exact procedure may occur, depending on whether local or remote operation is employed. The operating instructions in paragraph 2 presume that the equipment has been installed properly, checked by qualified technical personnel, and is ready for operation. It is also assumed that the internally located AVC, CLIP-FILT, and VOL EXP switches are all in the ON position. Refer to Section 5 if proper operation is not obtained; typical meter readings appear in table 5-1.

2. STARTING AND TUNING PROCEDURE.

a. Open the right access door and open the hinged door containing the CRYSTAL SELECTOR switch and turret assembly; insert the proper crystals for the desired operating frequencies. The numbers on the turret indicate the crystal position corresponding to the switch position indicated on the front panel of the unit.

Note

The frequency marked on the crystal is the oscillator frequency. The output frequency is six times the oscillator frequency.

b. Place the LOCAL-REMOTE switch in the LOCAL position

c. Turn the CRYSTAL SELECTOR (A) to the crystal position corresponding to the desired frequency.

d. Set the R.F. DRIVER TUNING (B), P.A. GRID TUNING (C), and P.A. TUNING (D) controls to the settings indicated on the tuning chart inside the righthand door. (See figures 4–1 and 4–2.)

e. Place the METER switch in the TRIPLER I_g position.

f. Set the POWER ON-EMERGENCY OFF switch to the POWER ON position.

g. Place and hold the START-STOP switch in the START position until the red POWER indicator lights. On model AN/URT-7B, allow 30 seconds for warm up. If the blower motor does not operate, thermal relay K404 will open the ac power circuit in the equipment.

Note

All indicator lamps have dimmers which, if completely closed, will keep light from being emitted.

h. Ascertain, by listening, that the blower motor is operating.

CAUTION

If the blower motor is not operating, immediately throw the POWER ON-EMERGENCY OFF switch to the EMERGENCY OFF position. Have a technician locate and make necessary repairs.

i. Operate the CARRIER TEST switch and tune the R.F. DRIVER TUNING control for maximum reading on the meter. This reading will be approximately 105.

j. Place the METER switch in the PA I_g position.

k. Operate the CARRIER TEST switch and tune the P.A. GRID TUNING control and R.F. DRIVER TUNING control for maximum meter reading (approximately 30 to 45, depending upon the frequency.)

l. Place the METER switch in the OUTPUT position.

m. Operate the CARRIER TEST switch and tune

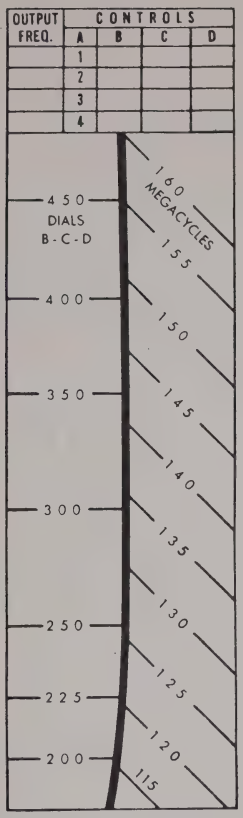


Figure 4—2. Tuning Chart

the P.A. TUNING control for maximum. This reading should be approximately 35.

n. Lock all tuning controls and log the dial and meter readings. Close the right access door.

o. The Radio Modulator controls located behind the left access door do not normally require resetting when the output frequency is changed. However, the setting of these controls should be checked in the following manner:

(1) Place the MCW-PHONE switch in the PHONE position.

(2) Connect the handset or microphone at the appropriate jack on the front panel.

(3) Place the METER switch in the AVC position.

(4) Close the press-to-talk switch and speak into the microphone. A maximum meter indication of approximately 50 should occur on the loudest syllables. If this is not the case, speak into the microphone and adjust the SP AMP control until the meter indicates this value.

(5) Place the METER switch in the MOD position.

(6) Close the press-to-talk switch and hum loudly into the microphone. The meter should read approximately 55. If this reading is too high or too low it should be correctly set, using the MOD control. This control should then be locked.

(7) Place the METER switch in the VOL EXP position.

(8) Close the press-to-talk switch. The meter reading should be about 41. Hum into the microphone; the reading should jump to 80 or more. If both these conditions are not met, readjust and then lock the EXP control.

p. The equipment is now ready for operation. If remote control is desired, place the LOCAL-REMOTE switch in the REMOTE position.

q. To place the equipment in its stand-by state, set the START-STOP switch to the STOP position

r. Placing the POWER ON-EMERGENCY OFF switch in the EMERGENCY OFF position removes all power from the equipment and disables the control from a remote location.

3. INTERNAL RADIO MODULATOR SWITCHES.

a. GENERAL.—The three toggle switches mounted at the top of the chassis, inside the Radio Modulator unit, are normally left in the ON positions; see figure 5–1. Because of that, the switches are not considered operating controls in the same sense as those controls which have been described in the preceding portions of this section. However, if any of these switches require resetting, it will usually be accomplished by the operator acting under instructions from authorized maintenance or communications personnel. Consequently, operating personnel should become familiar with the location and function of these internal controls.

In order to gain access to the top of the Radio Modulator unit, the main chassis must be partially withdrawn from the cabinet; this is accomplished by loosening the captive wingnuts on the front panel and pulling the chassis out by means of the handles on either side of the panel until the switches are accessible.

b. SWITCH SETTINGS.

(1) "CLIP-FILT" SWITCH.—This control switches the speech clipper-filter circuit in or out of the audio circuit. When the switch is ON, the clipper and filter circuits increase the average effective modulation percentage. The resultant side-band intelligence is high, although some speech distortion is caused by the clipping action. If the CLIP-FILT switch is OFF, audio frequencies higher than 3,500 cps will be transmitted and the distortion resulting from the clipper circuit will be eliminated. However, the average modulation will decrease if the audio

gain controls are set so that modulation on audio peaks does not exceed 100 percent.

(2) "AVC" SWITCH.—When this switch is ON, the AVC circuit maintains a nearly constant audio level, regardless of variations in loudness of speech. This switch should be thrown OFF when improperly functioning AVC circuits prevent use of the equipment. If switching the AVC circuit out permits operation, the Radio Transmitter may be operated in this manner until repairs can be made by a qualified technician. The AVC switch should also be set to OFF whenever the VOL EXP switch is OFF. As explained in subparagraph (3) below, background noise will modulate the carrier when the volume expander is off. Since the AVC circuit tends to equalize the amplitude of all sounds reaching the speech-amplifier stages, switching that circuit off will improve the audio signal-to-noise ratio, when the VOL EXP switch is OFF.

(3) "VOL EXP" SWITCH.—In the ON position, this switch permits the volume-expander circuit to control the Radio Modulator output. The volume expander prevents background noise from modulating the carrier during pauses in speech by cutting off the speech circuits during such pauses. If the audio stages are held inoperative because the volume expander fails to function properly, the VOL EXP switch should be thrown OFF until repairs can be made by a technician.

Note

When any of these switch positions are changed, the settings of the Radio Modulator front-panel controls should be checked and readjusted, as outlined in paragraph 2*o*.

4. REMOTE OPERATION.

a. OPERATION FROM TRANSMITTER CONTROL NAVY TYPE -23555.

(1) At the Radio Transmitter, perform the procedure described in paragraph 2, this section.

(2) Turn the LOCAL-REMOTE switch on the front panel of the Radio Transmitter to the REMOTE position. Place the MCW-PHONE switch, also on the front panel, in the desired position.

(3) Throw the REMOTE-OFF switch on the front panel of the control unit to the REMOTE position.

Note

This switch should always be set to the OFF position when the remote unit is not in use.

(4) The remote unit is now ready to operate, using the microphone press-to-talk switch or telegraph key to control the Radio Transmitter. Start-stop operation is *not* provided from this unit. The volume control on the front of the control unit is provided to set the audio level in the earphones.

b. OPERATION FROM REMOTE RADIOPHONE UNIT NAVY TYPE -23500.

(1) At the Radio Transmitter, perform the procedure described in paragraph 2, this section.

(2) Turn the LOCAL-REMOTE switch on the front panel of the Radio Transmitter to the REMOTE position. Place the MCW-PHONE switch, also on the front panel, in the desired position.

(3) Normal operation may now be controlled from the remote unit. The Radio Transmitter may be switched on and off (equivalent of START-STOP switch), provided the POWER ON-EMERGENCY OFF switch remains in the POWER ON position.

5. EMERGENCY OPERATION WITHOUT A CRYSTAL.

Radio Transmitter T-336/URT-7 is designed for operation with a type CR-24/U crystal in the radio-frequency oscillator circuit. However, it is possible to connect a small capacitor or composition resistor across the crystal-contact springs and maintain satisfactory power output from the equipment.

Note

This type of operation should not be used except in an emergency, since the frequency stability and tracking are not as good as in crystal-controlled operation.

If it becomes necessary to operate the equipment at a frequency for which a crystal is not available, proceed as follows:

a. Connect a capacitor (either mica or ceramic) of any value from 470 mmf to 1,000 mmf, or a composition resistor (one-half or one watt) of any value between 100 and 470 ohms, across the CRYSTAL SELECTOR fixed contact springs. If none of these components are available, the equipment may be operated *temporarily* by shorting the contact springs with a wire jumper.

b. Set the R.F. DRIVER TUNING, P.A. GRID TUNING, and P.A. TUNING controls to the dial readings indicated on the tuning chart for the frequency desired; see figure 4–2.

c. Start the equipment and switch on the carrier, following the applicable instructions of paragraph 2, this section.

d. Adjust the P.A. GRID TUNING control for maximum meter reading in the PA I_g position of the METER switch. Tune the P.A. TUNING control for maximum meter reading in the OUTPUT position of the METER switch.

e. Check the output frequency with a frequency meter, receiver, or other suitable frequency-measuring equipment.

f. Readjust the R.F. DRIVER TUNING control to correct any error between the actual and desired frequency. Retune the P.A. GRID TUNING and P.A. TUNING controls and again measure frequency. Repeat as often as necessary until the correct frequency is obtained.

SECTION 5
OPERATOR'S MAINTENANCE

1. GENERAL INSTRUCTIONS.

Ordinarily, operating personnel should make only those checks and adjustments which can be accomplished by means of front-panel controls and indications. In cases of emergency and with *proper authorization,* the maintenance listed under paragraph 2, this section, may be undertaken by the operator. Otherwise, further tests, checks, adjustments, etc., must be done by maintenance personnel, as outlined in Section 7 of this manual. Complete starting and tuning instructions are described in Section 4, paragraph 2.

A list of operating checks appears in the routine check chart, table 5–1. In general, these checks should be made at the beginning of each watch. However, if the equipment is in normal use at such time, items 1 and 2 may be omitted since it will be evident that operation is normal in these respects.

CAUTION

Do not continue operation of the equipment if the blower fails, or if meter readings are abnormal, particularly in the case of excessively high plate currents.

If the results noted in the Remarks and Precautions column are not obtained, refer to the instructions in paragraph 2 of this section or notify a maintenance technician, as required.

2. EMERGENCY MAINTENANCE.

Notice to Operators

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

a. REPLACEMENT OF FUSES.—Detailed information covering fuse locations, ratings, and protected circuits appears in table 5–2. It should be noted that the line fuses (F401 and F402) must be 4-ampere fuses if the equipment is operated from a 230-volt a-c line, or 8-ampere fuses if the power source is 115 volts.

Spare fuses are held in the fuse clips marked F403 and F405, located on the back of the access door to the Amplifier-Oscillator unit; see figure 3–3. When a fuse is removed, it should be replaced so that a spare fuse will always be immediately available.

WARNING

Never replace a fuse with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time unless the cause of failure has been corrected.

b. REPLACEMENT OF TUBES.—Figures 5–1, 5–2, and 5–3 illustrate the location of all tubes. Also, reference symbols are marked adjacent to the tubes in the equipment.

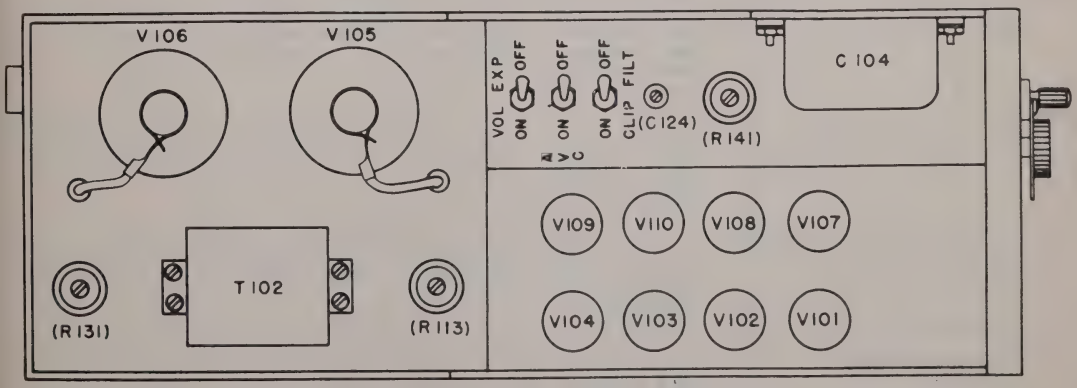


Figure 5–1. Radio Modulator MD-163/URT, Location of Tubes and Internal Controls

TABLE 5–1. ROUTINE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	REMARKS AND PRECAUTIONS
1. Proper starting of equipment.	Turn POWER ON-EMERGENCY OFF switch to POWER ON and START-STOP switch to START.	Note that the red POWER lamp lights and the *blower starts*. If blower does not operate, *turn off* POWER ON-EMERGENCY OFF switch *immediately*. If lamp does not light, check panel dimmer.
2. Carrier-control circuit.	Operate local CARRIER TEST switch to its MOMENTARY side; monitor audio with earphones plugged into EARPHONES jack.	Note that green CARRIER lamp lights and receiver noise stops in headphones. If lamp does not light, check panel dimmer.
3. Doubler grid current.	Set METER switch to DBLR I_g; operate CARRIER TEST switch; read meter.	Meter should read approximately 75–120. If no reading is obtained, check crystal seating by rotating and returning CRYSTAL SELECTOR switch to desired crystal position.
4. Tripler grid current.	Set METER switch to TRIPLER I_g; operate CARRIER TEST switch; read meter.	Meter should read approximately 105.
5. Power-amplifier grid current.	Set METER switch to PA I_g; operate CARRIER TEST switch; read meter.	Meter should read approximately 30–45.
6. R-F output.	Set METER switch to OUTPUT; operate CARRIER TEST switch; read meter.	Meter should read approximately 35.
7. AVC circuit.	Set METER switch to AVC position; operate microphone press-to-talk switch and hum into microphone; read meter.	Meter should read between 15 and 55 during humming.
8. Modulation level.	Set METER switch to MOD; operate microphone press-to-talk switch and speak in normal voice; read meter.	Meter should read approximately 65 on speech peaks.
9. Volume-expander operation.	Set METER switch to VOL EXP; operate microphone press-to-talk switch and hum into microphone; read meter.	Meter should read approximately 80 during humming.
10. Tripler plate current.	Set METER switch to TRIPLER I_p; operate CARRIER TEST switch; read meter.	Meter should read approximately 35.
11. Power-amplifier plate current.	Set METER switch to PA I_p; operate CARRIER TEST switch; read meter.	Meter should read approximately 75–87.

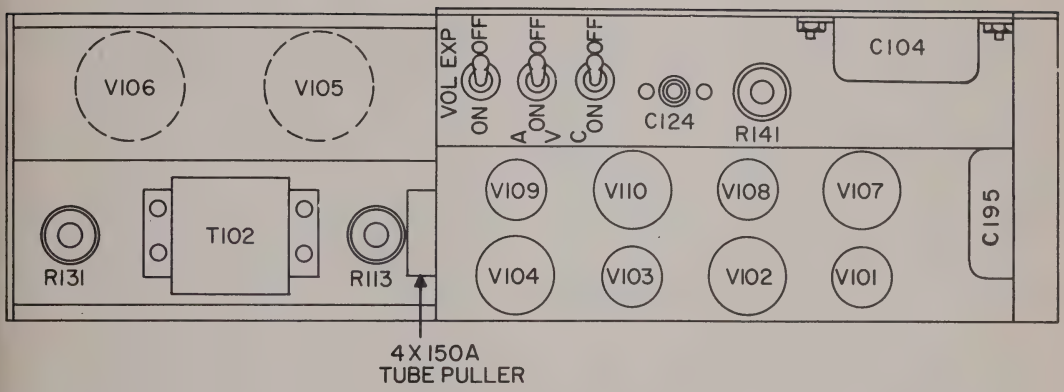


Figure 5—1A. Radio Modulator MD-163B/URT, Location of Tubes and Internal Controls

TABLE 5—2. FUSE LOCATIONS AND SYMPTOMS OF FAILURE

SYMBOL	LOCATION	PROTECTS	AMPS	VOLTS	NUMBER	SYMPTOMS OF FAILURE
F401	Front panel	Input power line	4 8	230 115	MDL-4 MDL-8	Equipment completely inoperative when F401 and/or F402 fails. Blower stops, indicator lamps go out, meter reads zero in all switch positions.
F402	Front panel	Input power line	4 8	230 115	MDL-4 MDL-8	
F403	Back of right access door	Spare for F401, F402	4 8	230 115	MDL-4 MDL-8	
F404	Front panel	Modulator plate circuit	0.25	600	AGC-¼	No modulation in MCW or phone operation; meter reads zero in MOD position of METER switch.
F405	Back of left access door	Spare for F404	0.25	600	AGC-¼	

WARNING

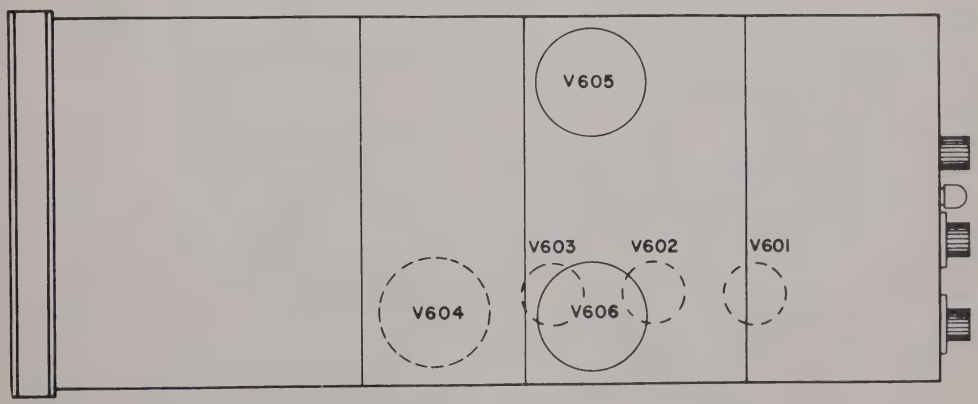
DANGEROUS VOLTAGES EXIST IN THE CHASSIS WHEN POWER IS ON. BE SURE THAT *POWER IS OFF* BEFORE STARTING TO REPLACE ANY TUBE.

The tubes in this equipment, with the exception of V601 through V604 in the Amplifier-Oscillator unit, are readily accessible for replacement by the operator when the main chassis is removed from the cabinet. All the tubes in the Radio Modulator unit are available from the top of the chassis. The rectifier tubes are located below the hinged shelf on which the antenna relay is mounted. The catch which secures this shelf may be released by the use of a thin coin or a screwdriver.

The r-f power-amplifier tubes are located under the cover plate on top of the Amplifier-Oscillator. This cover plate may also be released by use of a thin coin or screwdriver. To remove these tubes, use the tube puller (H103) provided, which is mounted in a clip on the Radio Modulator chassis, near the two modulator tubes at the rear; see figure 1–4. Insert the two ends of the U-shaped tool through opposite holes in the cooling vanes of the 4X150A tube. After making sure the hooked ends are properly engaged, apply a steady pull sufficient to remove the tube from its socket. Be ready to catch and hold the tube if it releases suddenly.

CAUTION

When replacing one of these tubes, be sure to engage the tube key with the socket keyway properly before pressing it home.



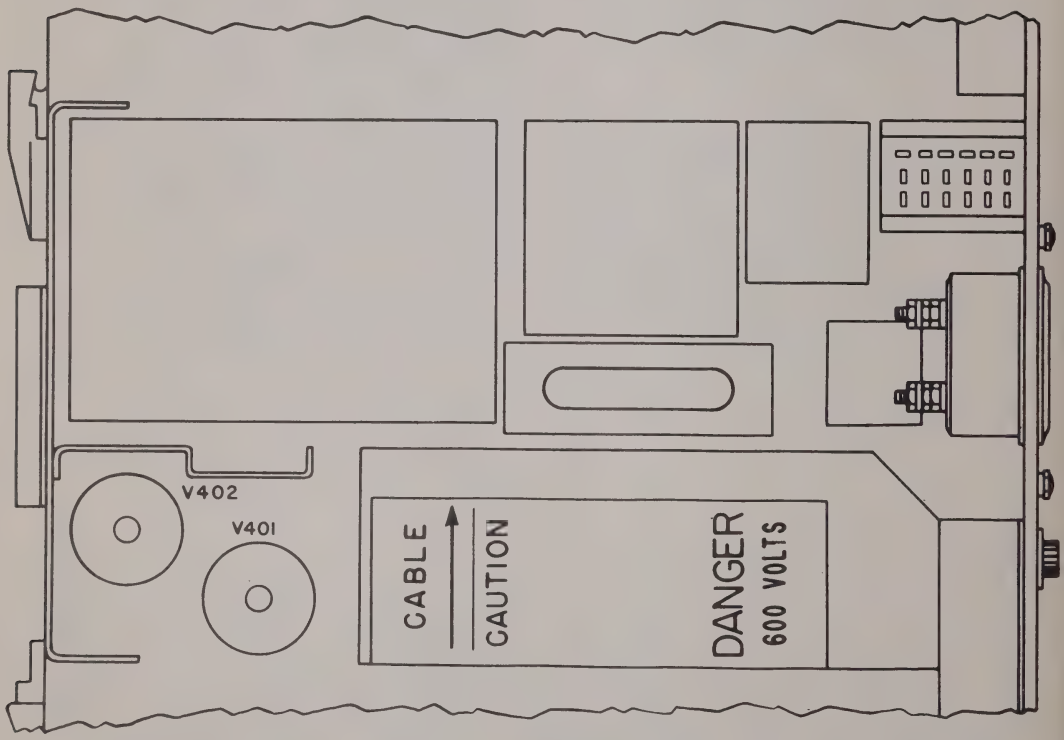
NOTE: V605 & V606 SHOWN EXPOSED BY REMOVAL OF PERFORATED TUBE ACCESS COVER.

Figure 5—2. Amplifier-Oscillator AM-638/URT, Location of Tubes

When replacing the cover plate over the r-f amplifier tubes, be certain that the fasteners are securely seated. If this is not done and one of the fasteners becomes released when in the cabinet, removal of the main chassis from the cabinet will be very difficult.

To remove any of the tubes located in the radio-frequency driver section (V601 through V604), it is necessary to remove the Amplifier-Oscillator unit from the main chassis. To do this, remove the main chassis from its cabinet or relay rack. After removing the Amplifier-Oscillator chassis from the main chassis, remove the left side shield from the Amplifier-Oscillator. V601, V602, and V603 are then readily available for replacement. V604 is the same type (4X150A) as the power-amplifier tubes, but does not require the use of the tube puller, because of its location and method of mounting. In order to remove V604, it is necessary to loosen the screw fastening on the clamp which contacts the anode of the tube.

c. SYMPTOMS OF DEFECTIVE TUBE OPERATION.—The symptoms which may indicate defective tube operation will be failure of one or more operating functions and/or abnormal meter readings in one or more of the METER switch positions. In practically all cases, defective operation will be accompanied by abnormal meter readings. Therefore, the meter readings are a good general guide. Table 5–3 indicates possible defective tubes for an incorrect reading in a given METER switch position; all switch positions are covered. This information should be utilized in conjunction with that provided in table 5–1, Routine Check Chart. If the recommended tube changes do not correct faulty operation of the equipment, qualified maintenance personnel should be notified to perform the necessary repairs or adjustments.



NOTE: COAXIAL RELAY K403 REMOVED TO EXPOSE V401 & V402. CLIPS FOR V401 & V402 PLATE CAPS ATTACHED TO UNDERSIDE AT K403 HINGED SHELF

Figure 5–3. Power Supply PP-773/URT, Location of Tubes

TABLE 5—3. SYMPTOMS OF DEFECTIVE TUBES

SYMPTOM	POSSIBLE DEFECTIVE TUBES
1. Abnormal DOUBLER I_g meter reading.	V601, V602
2. Abnormal TRIPLER I_g meter reading; DOUBLER I_g reading normal.	V603, V604
3. Abnormal PA I_g meter reading; TRIPLER I_g and TRIPLER I_p readings normal.	V605, V606
4. Abnormal OUTPUT meter reading; PA I_g reading normal.	V605, V606
5. Abnormal AVC meter reading.	V101, V102
6. Abnormal MOD meter reading; AVC and VOL EXP readings normal.	*V105, V106
7. Abnormal VOL EXP meter reading; AVC reading normal.	V104, V107, V108, V109
8. Abnormal VOL EXP and MOD meter readings; AVC reading normal.	V105, V106
9. Abnormal TRIPLER I_p meter reading; TRIPLER I_g reading normal.	V604
10. Abnormal PA I_p meter reading; PA I_g reading normal.	V605, V606

*Check fuse F404 before replacing modulator tubes (V105, V106).

SECTION 6
PREVENTIVE MAINTENANCE

1. GENERAL.

While it is anticipated that Radio Transmitting Set AN/URT-7 will provide as continuous and as trouble-free operation as is possible, a certain amount of wear and component break-down must be expected in any equipment of this type. However, if detected and corrected at an early stage, trouble from these causes can be minimized; if nothing is done until a break-down actually occurs (assuming that early symptoms of the defect manifest themselves), a serious shut-down may become necessary at a time when the equipment is most needed.

2. ROUTINE MAINTENANCE CHECK CHARTS.

Since wear and deterioration are not always evident in themselves during normal operation, it is essential to continued trouble-free operation that certain vital points of the equipment be inspected periodically. This inspection includes both an electrical inspection, made by means of the front-panel meter readings, and mechanical inspections of various portions and components of the equipment. Tables 6–1 through 6–4 list the *minimum* requirements of such inspection checks. It is not unlikely that this schedule will be modified during actual operational use of the equipment, since operating schedules and other tactical requirements will become determining factors in establishing inspection routines. Nevertheless, all checks outlined in the charts should be performed at intervals close to those indicated, with additional checks as may be specified by authorized maintenance personnel.

Note

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE *BUREAU OF SHIPS MANUAL* OF THE LATEST ISSUE.

TABLE 6–1. DAILY MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	CORRECTIVE MEASURES
1. Meter readings.	Compare readings with previously logged values or with typical readings in table 5–1.	Investigate extreme differences in readings and correct.
2. Temperature and ventilation.	*a.* Feel cabinet for excessive operating temperature. *b.* Observe operation of blower and condition of the filter.	Be certain blower operates to properly ventilate cabinet and that air filter is not clogged.

TABLE 6–2. WEEKLY MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	CORRECTIVE MEASURES
1. Blower motor brushes.	Remove side panels from blower compartment and remove brushes.	Replace brushes if shorter than ¼ in. or if otherwise damaged; see Section 7, par. 6*b*. If replacement is not required, be certain to return each brush to holder from which it was removed; maintain previous orientation with respect to motor rotation.
2. Front-panel and chassis controls, knobs, switches, etc.	Check for looseness of switch and control mounting nuts. Check for missing or loose knobs.	Tighten loose mounting nuts and knobs; replace missing knobs.

TABLE 6—3. MONTHLY MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	CORRECTIVE MEASURES
1. Terminal boards and connectors.	Check connections.	*a.* Clean and tighten all contacts. *b.* Remove any frayed wire ends.
2. Relays	Check movement and contacts.	Clean and burnish all contacts; see par. 5, this section. Be sure movement is not impeded and is sufficient to make and break all necessary contacts.
3. Air filter.	Remove and examine air filter.	*a.* Clean with solution of hot water and grease solvent, such as dish-washing compound (SNSN G51-E-1576-100). Let dry thoroughly. *b.* Dip in Military Symbol -2190T or -3100 lubricating oil or a similar grade oil (SAE 30 to 50) according to operating temperature. Let excess drain off (½ hr).
4. Tuning capacitors.	Check gear trains for free movement and backlash.	Clean thoroughly, and adjust backlash; see Section 7, par. 3*d*.

TABLE 6—4. SEMI-ANNUAL MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	CORRECTIVE MEASURES
1. Blower Motor	Remove assembly per instructions in Section 7, Par. 6C	Clean unit and replace defective parts, See section 7, Par. 6.
2. Thermal relay K404 on model AN/URT-7B	Press START switch. Equipment should start. If it does not, check relay contacts.	Relay contacts are normally closed.
	Cover ventilation slots between r-f and power supply sections with tape. Start equipment. K404 contacts should open in about 20 seconds and stop equipment.	Be sure to remove tape from slots at end of test.

3. LUBRICATION.

No part of this equipment requires lubrication. The ball bearings used in the blower motor (B601) are of the doubly sealed type. Deterioration, therefore, is mainly dependent upon the chemical life of the grease. This, in turn, depends upon running temperature. It is expected that the chemical life of the grease is well over 1,000 hours. It is recommended that after 1,000 hours of operation, when replacement of brushes is due, the motor be blown out and new bearings fitted; refer to Section 7, paragraph 6.

4. RE-TROPICALIZATION.

Re-tropicalization is not required, since in manufacture the Radio Transmitter is not tropicalized as a complete assembly, or by subassemblies. Instead, use is made of components and materials which are either inherently resistive to moisture and fungus growth, or which have been tropicalized prior to assembly in the equipment. The maintenance parts supplied are identical in all respects (including tropicalization) to those used in the equipment; therefore, it will not be necessary to tropicalize items from the spare parts kit when making repairs.

5. CARE OF RELAYS.

Relays K101 (figure 7–16), K401 and K402 (figure 7–6) require periodic inspection and cleaning in order to rid the contacts of accumulated dirt and grime. For monthly maintenance purposes, a visual check of the relays' condition will suffice. If corrosion or dirt is encountered on any of the contacts, as evidenced by inspection or by defective operation, clean the contacts.

This can be done by moistening a clean strip of paper with a volatile cleaning solution (Federal Specification No. P-S-661a) and drawing the paper between the contacts while holding them closed. If any dirt or corrosion persists after this treatment, clean the contacts with a suitable burnishing tool.

Note

Do *not* use carbon tetrachloride to clean relay contacts.

Check to see that all relay armatures are free and do not bind during movement. Springs should be straight and free from damage or distortion; contact gaps should be uniform. The operation of the armature, springs, and contacts can be observed by operating the armature manually. In making such checks, be careful not to disturb spring settings, contact gaps, etc. of normally functioning relays.

FAILURE REPORTS

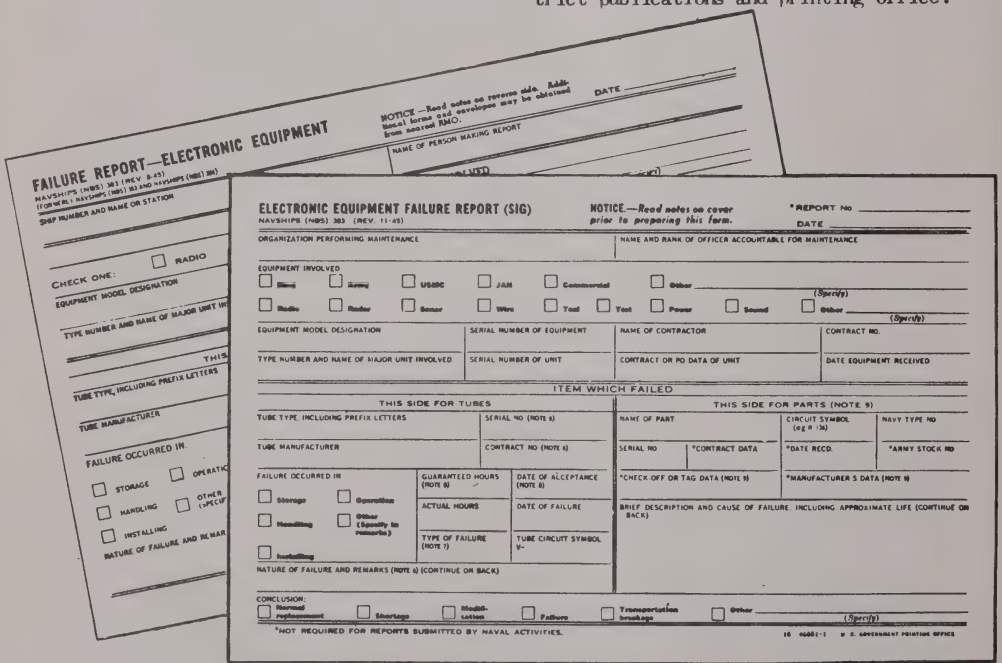
A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form DD-787, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest district publications and printing office.



FAILURE REPORT—ELECTRONIC EQUIPMENT

NAVSHIPS (NBS) 383 (REV. 8-45)
(FORMERLY NAVSHIPS (NBS) 80 AND NAVSHIPS (NBS) 384)

NOTICE—Read notes on reverse side. Additional forms and envelopes may be obtained from nearest RMO.

DATE

NAME OF PERSON MAKING REPORT

SHIP NUMBER AND NAME OR STATION

CHECK ONE: RADIO

EQUIPMENT MODEL DESIGNATION

TYPE NUMBER AND NAME OF MAJOR UNIT INV

THIS

TUBE TYPE, INCLUDING PREFIX LETTERS

TUBE MANUFACTURER

FAILURE OCCURRED IN:

STORAGE OPERATIC

HANDLING OTHER (SPECIF

INSTALLING

NATURE OF FAILURE AND REMAR

ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)

NAVSHIPS (NBS) 383 (REV. 11-45)

NOTICE—*Read notes on cover prior to preparing this form.*

*REPORT NO

DATE

ORGANIZATION PERFORMING MAINTENANCE

NAME AND RANK OF OFFICER ACCOUNTABLE FOR MAINTENANCE

EQUIPMENT INVOLVED

Navy Army USCGC JAN Commercial Other (Specify)

Radio Radar Sonar Wire Test Test Power Sound Other (Specify)

EQUIPMENT MODEL DESIGNATION	SERIAL NUMBER OF EQUIPMENT	NAME OF CONTRACTOR	CONTRACT NO.
TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED	SERIAL NUMBER OF UNIT	CONTRACT OR PO DATA OF UNIT	DATE EQUIPMENT RECEIVED

ITEM WHICH FAILED

THIS SIDE FOR TUBES

TUBE TYPE, INCLUDING PREFIX LETTERS	SERIAL NO (NOTE 6)
TUBE MANUFACTURER	CONTRACT NO (NOTE 6)

FAILURE OCCURRED IN

Storage Operation Handling Other (Specify in remarks) Installing

GUARANTEED HOURS (NOTE 8)	DATE OF ACCEPTANCE (NOTE 8)
ACTUAL HOURS	DATE OF FAILURE
TYPE OF FAILURE (NOTE 7)	TUBE CIRCUIT SYMBOL V-

NATURE OF FAILURE AND REMARKS (NOTE 6) (CONTINUE ON BACK)

THIS SIDE FOR PARTS (NOTE 9)

NAME OF PART	CIRCUIT SYMBOL (eg R-36)	NAVY TYPE NO
SERIAL NO *CONTRACT DATA	*DATE RECD.	*ARMY STOCK NO
*CHECK OFF OR TAG DATA (NOTE 9)	*MANUFACTURER'S DATA (NOTE 9)	

BRIEF DESCRIPTION AND CAUSE OF FAILURE, INCLUDING APPROXIMATE LIFE (CONTINUE ON BACK)

CONCLUSION:

Normal replacement Shortage Modification Failure Transportation breakage Other (Specify)

*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.

16 66681-1 U. S. GOVERNMENT PRINTING OFFICE

Figure 7—1. Failure Report, Sample Form

SECTION 7
CORRECTIVE MAINTENANCE

1. THEORY OF TROUBLE LOCALIZATION.

An important part of remedying defective equipment operation is the procedure of localizing the source of trouble to a small portion, section, or stage of the equipment, before making detailed checks on individual components. Proper isolation of the trouble to a definite section avoids time-wasting detailed checks in sections or circuits that may be completely free of defective operation in themselves.

In most electronic equipment, such a localizing procedure consists mainly of a "signal-tracing" method. In the case of r-f circuits, such as in the Amplifier-Oscillator unit of the Radio Transmitter, this will be a stage-to-stage check; the starting point can be either at the output where signal is missing or defective, and checking backward until normal signal is encountered, or alternatively, at the oscillator and checking each stage until signal defect is encountered. In either case, the faulty stage would generally be indicated as the first stage (in normal signal progression) where the signal was found to be defective or missing. In the Radio Modulator unit, a similar procedure should be used, except for some of the special circuits incorporated therein. Methods of isolating trouble in these circuits are described in later paragraphs. In the Power Supply circuits, where the "signal" to be traced is a supply voltage rather than an audio- or radio-frequency signal, the procedure is still basically the same, except that the voltages will be traced from output terminals back to filters, rectifiers, transformers, etc., rather than in a stage-by-stage check.

When trouble is encountered, make it a habit to consider the existing indications carefully and properly isolate the trouble, rather than making hasty and haphazard spot checks at various points in the equipment. Many troubles can be traced to a section or stage by using the front-panel meter readings as indications of defective circuit operation.

2. TROUBLE SHOOTING.

a. GENERAL.—Radio Transmitter T-336/URT-7 is composed of three major units: Amplifier-Oscillator AM-638/URT, Radio Modulator MD-163/URT, and Power Supply PP-773/URT. Therefore, the first step in trouble shooting is to localize the particular defect to one of the three units. In general, this can be accomplished by correct interpretation of the readings obtained on the front-panel meter, prior to removing the equipment from its cabinet or rack.

The second step in servicing is to localize the fault to the defective component responsible for the abnormal condition. Some faults, such as burned-out resistors, r-f arcing, and shorted transformers, may be located by sight, smell, and sound. The majority of faults, however, must be located by electrical tests, usually the checking of voltages and resistances.

WARNING

VOLTAGES ARE PRESENT IN THIS EQUIPMENT WHICH ARE DANGEROUS AND WHICH MAY BE FATAL IF CONTACTED. OBSERVE ALL SAFETY PRECAUTIONS; REFER TO THE SAFETY NOTICE AT THE FRONT OF THIS INSTRUCTION BOOK.

b. INTERPRETATION OF METER READINGS.—The meter on the front panel of the equipment provides indications of circuit operation for many of the stages in both the Amplifier-Oscillator and Radio Modulator units. The interpretation of these meter readings, however, and the correlation of abnormal readings to the defective stage, are functions of the skill and knowledge of the trouble-shooting technician. Complete familiarity with the theory of operation of the equipment is extremely important if servicing is to be accomplished in a minimum of time. Section 2 of this instruction book explains the operation of all circuits in the equipment, including those used for metering. It is strongly recommended that this material be reviewed before any trouble shooting or repair is attempted.

Various stages in the Amplifier-Oscillator are monitored in the following positions of the METER switch (S401): DOUBLER I_g, TRIPLER I_g, TRIPLER I_p, PA I_g, PA I_p, and OUTPUT. Switch positions AVC, MOD, and VOL EXP permit the meter to check certain circuits in the Radio Modulator, but not in so straightforward a manner as for the r-f circuits. However, all the meter circuits are explained in Section 2, paragraph 2*d*, with the audio positions of S401 sufficiently described to allow proper interpretation of readings by the average radio technician. Normal meter readings are incorporated in table 5–1.

c. TEST EQUIPMENT AND BENCH SET-UP.—Maintenance, testing and trouble shooting can be performed on the Radio Transmitter without the use of *special* test equipment. However, the following general-purpose test equipment is required in order to service the Radio Transmitter.

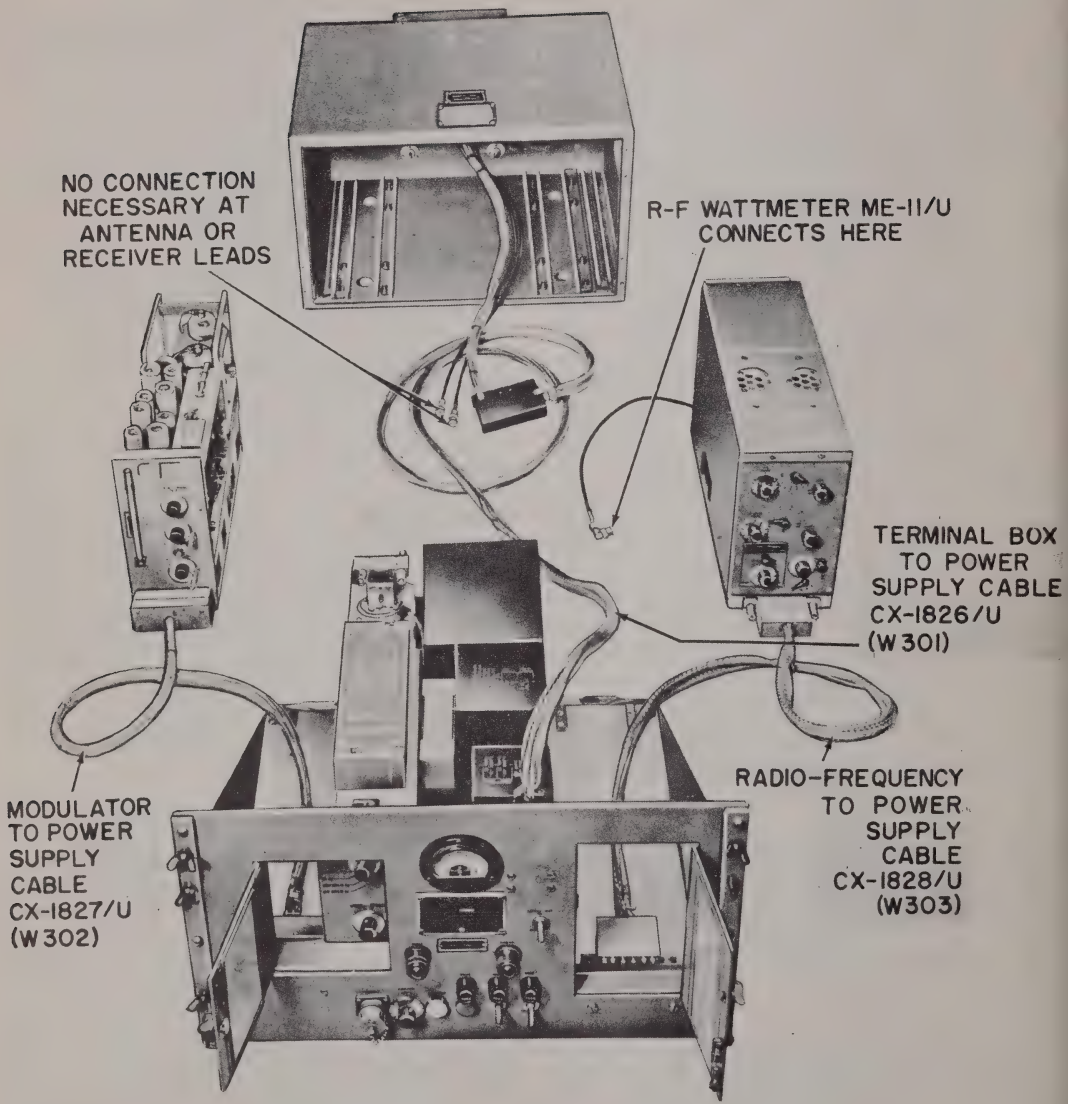

NO CONNECTION NECESSARY AT ANTENNA OR RECEIVER LEADS
R-F WATTMETER ME-11/U CONNECTS HERE
TERMINAL BOX TO POWER SUPPLY CABLE CX-1826/U (W301)
MODULATOR TO POWER SUPPLY CABLE CX-1827/U (W302)
RADIO-FREQUENCY TO POWER SUPPLY CABLE CX-1828/U (W303)

Figure 7–2. Bench Test Interconnections with Special Purpose Cable Assemblies

(1) Multimeter TS-352/U, or equal (1,000 ohms per volt).

(2) R-F Wattmeter ME-11/U, or equal.

(3) Oscilloscope OS-8/U, Navy Model OBL, Navy Model OBT, or equal.

(4) Audio Oscillator Navy Model LAJ, or equal.

When trouble shooting the equipment, it is impossible to accomplish all the necessary measurements with the units assembled, as is evident from the physical construction of those units. Therefore, a bench test set-up is required which permits the units to be mechanically disassembled from one another, but to remain electrically interconnected so that the equipment can function. The three special-purpose cable assemblies supplied with the equipment are used to interconnect the units, as shown in figure 7–2; the cables function as follows:

(1) Cable Assembly CX-1826/U (W301) connects J501 from the terminal box to P403 on the Power Supply chassis. The cable is used only when the equipment is normally contained in the cabinet, to allow freedom of movement of the main chassis; if the equipment is rack-mounted, the terminal box will have been secured to the rear of the main chassis.

(2) Cable Assembly CX-1827/U (W302) connects the Radio Modulator unit to the Power Supply chassis.

(3) Cable Assembly CX-1828/U (W303) connects the Amplifier-Oscillator unit to the Power Supply chassis.

d. REFERENCE MATERIAL SUPPLIED.—Take advantage of the reference material supplied in this instruction book to help in the rapid location of faults. Consult the following material when applicable:

(1) Schematic diagram, figure 7–28.

(2) Trouble-shooting charts, tables 7–1 to 7–3.

(3) Transformer and coil information, table 7–5.

(4) Capacitor and resistor color codes, table 8–5.

(5) Illustrations of equipment sections for use in locating and identifying parts and tracing circuits, figures 3–10, 7–6 to 7–8, 7–10 to 7–12, 7–14 to 7–19, and 7–22 to 7–24.

(6) Equipment interconnection diagram, figure 3–11.

(7) Primary power distribution diagram, figure 2–10.

(8) Practical wiring diagrams, figures 7–29 to 7–32.

(9) Tube characteristics, table 7–4.

e. VOLTAGE MEASUREMENT PROCEDURE.

WARNING

VOLTAGES OVER 300 VOLTS SHALL BE MEASURED AS DESCRIBED BELOW.

(1) De-energize the equipment. Ground the terminals to be measured to discharge any capacitors connected to those terminals; see step (10).

(2) Connect the test meter to the terminals to be measured, using a range higher than the expected voltage.

(3) *Without touching meter or test leads,* energize the equipment and read the meter.

(4) De-energize the equipment. Ground the terminals connected to the meter before disconnecting the meter.

(5) *Make sure* you are *not grounded* whenever you are adjusting equipment or using measuring equipment.

(6) In general, *use one hand only* when servicing live equipment.

(7) If the test meter must be held or adjusted while voltage is applied, *ground* the *case* of the meter before starting measurement and *do not* touch the live equipment or personnel working on live equipment while you are holding the meter. Some moving-vane type meters should not be grounded; these should not be held during measurements.

(8) *Do not forget* that, because of equipment breakdown, *high voltages may be present* across terminals that are normally at low potentials. Be careful even when measuring low voltages.

(9) *Do not* use test equipment known to be in poor condition.

(10) High-voltage, high-capacity capacitors should be discharged with a grounding stick with approximately 10 ohms in series with the grounded line. Where neither terminal of a capacitor is grounded, short the capacitor terminals to each other.

f. USE OF TROUBLE-SHOOTING CHARTS.—The trouble-shooting charts (tables 7–1, 7–2, and 7–3) have been compiled for the purpose of facilitating rapid localization of trouble in the equipment. The three tables divide the possible sources of trouble into control and power circuits, r-f circuits, and a-f circuits, in that sequence, and are based primarily on symptoms which are perceptible either visually or audibly.

When the trouble-shooting charts are used, it is recommended that the symptoms described in table 7–1 be investigated before proceeding to table 7–2 or table 7-3. Checking the equipment in that manner will usually permit the maintenance technician to isolate the cause of defective operation to one of the major groups of circuits, mentioned above. For example, if either the control or power circuits are defective, the fault usually manifests itself as one of the symptoms between 1 and 4 in table 7–1. Similarly, trouble in the radio- or audio-frequency stages usually results in symptom 5 or 6, respectively. The corrective measures for the latter two symptoms then refer the technician to either table 7–2 or 7–3.

Regardless of which chart is being used, the symptoms listed therein should be investigated in numerical sequence. They have been prepared in such manner that defective circuits which could normally have two or more indicative symptoms are listed as being possibly defective only under the symptom which first appears in the chart. An example of this is the –42-volt rectifier circuit. Failure of that power source would affect both the tripler and power-amplifier stages in the Amplifier-Oscillator. Since the symptoms associated with a faulty tripler stage call for trouble shooting that rectifier circuit, the information is not repeated under power-amplifier corrective measures; presumably, the defective circuit would be found from the indication of improper tripler operation.

Note

Before attempting to trouble shoot the equipment, be sure that an attempt has been made to tune and adjust it in accordance with the procedure outlined in Section 4, paragraph 2.

TABLE 7–1. EQUIPMENT, CONTROL, AND POWER CIRCUIT TROUBLE-SHOOTING CHART

SYMPTOM	PROBABLE TROUBLE	CORRECTIVE MEASURE
1. Red POWER lamp (I401) does not light when S403 is set to POWER ON and S402 is pressed to START.	1. *a.* No primary power.	1. *a.* Check power source and connections to equipment.
	b. Line fuse(s) blown.	*b.* Replace F401, F402.
	c. Lamp burned out.	*c.* Replace I401.
	d. 115/230-volt transformer circuit defective or improperly connected.	*d.* Check T402 and terminal connections.
	e. Start-stop circuit defective.	*e.* Check S402, K402, R412.
	f. –12-volt rectifier defective.	*f.* Check T401, CR401, L402, C404, C405.
2. Blower (B601) does not start.	2. *a.* Amplifier-Oscillator unit not properly seated on main chassis.	2. *a.* Push unit in and set snap lock at rear.
	b. Open power circuit.	*b.* Check wiring, contacts of J601, P402, check filter E601.
	c. Motor defective.	*c.* Repair or replace motor. (See par. 6, this section.)
3. Green CARRIER lamp (I402) does not light when CARRIER TEST switch (S405) is ON or when either key or microphone press-to-talk switch is closed.	3. *a.* Lamp burned out.	3. *a.* Replace I402.
	b. Carrier-control circuit defective.	*b.* Check V110, K401, K403, 300-volt power source.
	c. Keying circuit defective.	*c.* Check K101, S405, T101, –42-volt rectifier (T401, CR402, L403, C406, C407).
4. No meter indications in both OUTPUT and MOD positions of METER switch.	4. *a.* High-voltage rectifier defective.	4. *a.* Check V401, V402; trouble shoot power supply.
	b. Meter circuit defective.	*b.* Check M401, S401, R414.
5. Zero or low meter reading in OUTPUT position; MOD indication normal.	5. Amplifier-Oscillator r-f circuits defective.	5. Trouble shoot Amplifier-Oscillator. (See table 7–2.)
6. Zero or low meter reading in MOD position; OUTPUT indication normal.	6. Radio Modulator audio circuits defective.	6. Trouble shoot Radio Modulator. (See table 7–3.)
7. Equipment operates at excessive temperature.	7. Blower air filter clogged.	7. Clean air filter. (See table 6–3.)

TABLE 7–2. R–F CIRCUITS TROUBLE-SHOOTING CHART

SYMPTOM	PROBABLE TROUBLE	CORRECTIVE MEASURE
1. Zero or low doubler grid current; METER switch set to DOUBLER I_g.	1. *a.* Oscillator defective.	1. *a.* Check V601; trouble shoot oscillator circuit.
	b. Doubler defective.	*b.* Check V602; trouble shoot doubler circuit.
	c. Crystal switch S601 or crystal (Y601–Y604) defective.	*c.* Replace defective component.
	d. Oscillator tank circuit misaligned.	*d.* Realign r-f circuits. (See par. 4, this section.)
2. Zero or low tripler grid current; METER switch set to TRIPLER I_g.	2. *a.* Doubler defective.	2. *a.* Check V602; trouble shoot doubler circuit.
	b. Amplifier defective.	*b.* Check V603; trouble shoot amplifier circuit.
	c. Tripler defective.	*c.* Check V604; trouble shoot tripler circuit.
	d. Doubler or amplifier tank circuit misaligned.	*d.* Realign r-f circuits. (See par. 4, this section.)
3. Abnormally high tripler grid current; METER switch set to TRIPLER I_g.	3. *a.* Low grid bias.	3. *a.* Check and trouble shoot –42-volt rectifier.
	b. Meter circuit defective.	*b.* Check shunt resistor R403.
4. Zero or low tripler plate current; METER switch set to TRIPLER I_p.	4. *a.* Tripler defective	4. *a.* Check V604; trouble shoot tripler circuit.
	b. Screen-bypass capacitor shorted.	*b.* Check C619 for foreign metallic matter between plates.
	c. Low plate or screen voltage.	*c.* Check and trouble shoot high-voltage rectifier.
	d. High grid bias.	*d.* Check and trouble shoot –42-volt rectifier.
5. Abnormally high tripler plate current, or no variation in current when R.F. DRIVER TUNING is adjusted; METER switch set to TRIPLER I_p.	5. *a.* Tripler tank circuit misaligned.	5. *a.* Realign r-f circuits. (See par. 4, this section.)
	b. Mechanical slippage in tuning drive.	*b.* Check tuning drive and shaft coupling. (See par. 3*d*, this section.)
	c. Meter circuit defective.	*c.* Check shunt resistors R404, R405.
6. Zero or low PA grid current, or no variation in current when P.A. GRID TUNING is adjusted; METER switch set to PA I_g.	6. *a.* PA defective.	6. *a.* Check V605, V606; trouble shoot PA circuit.
	b. Coupling circuit defective.	*b.* Check W601, L611, L612.
	c. Tripler defective.	*c.* Check V604.
	d. Mechanical slippage in tuning drive.	*d.* Check tuning drive and shaft coupling. (See par. 3*d*, this section.)
7. Abnormally high PA grid current; METER switch set to PA I_g.	7. Meter circuit defective.	7. Check shunt resistor R402.

TABLE 7–2. R–F CIRCUITS TROUBLE-SHOOTING CHART (Cont)

SYMPTOM	PROBABLE TROUBLE	CORRECTIVE MEASURE
8. Zero or low PA plate current; METER switch set to PA I_p.	8. *a.* PA defective. *b.* Screen-bypass capacitor shorted to ground.	8. *a.* Check V605, V606; trouble shoot PA circuit. *b.* Check C642 for foreign metallic matter between plates.
9. Abnormally high PA plate current, or no variation in current when P.A. TUNING is adjusted; METER switch set to PA I_p.	9. *a.* Meter circuit defective. *b.* Mechanical slippage in tuning drive.	9. *a.* Check shunt resistor R406. *b.* Check tuning drive and shaft coupling. (See par. 3*d*, this section.
10. Zero or low r-f output; METER switch set to OUTPUT.	10. *a.* Crystal rectifier defective. *b.* PA tubes defective. *c.* Output filter misaligned. *d.* Monitor circuit defective.	10. *a.* Replace CR601. *b.* Check V605, V606. *c.* Realign r-f circuits. (See par. 4, this section.) *d.* Trouble shoot rectifier and filter circuit.

TABLE 7–3. AUDIO CIRCUITS TROUBLE-SHOOTING CHART

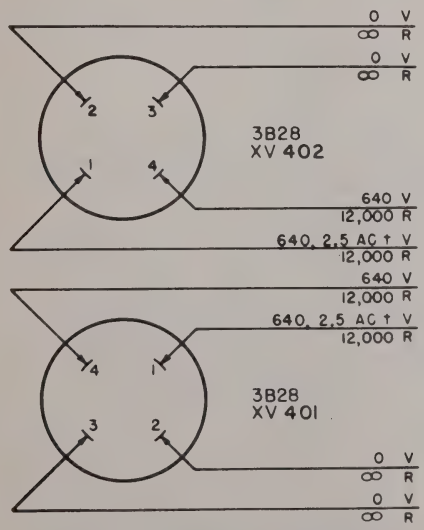
SYMPTOM	PROBABLE TROUBLE	CORRECTIVE MEASURE
1. No AVC voltage when speaking into microphone; METER switch set to AVC. (AVC switch S102 in ON position.)	1. *a.* SP AMP gain control misadjusted. *b.* Defective tube. *c.* 1st audio amplifier defective. *d.* AVC amplifier-rectifier circuits defective. *e.* Microphone or speech-input circuit defective. *f.* High grid bias at V102A.	1. *a.* Readjust control. (See Section 4, par. 2.) *b.* Check V101, V102. *c.* Trouble shoot stage. *d.* Trouble shoot circuits. *e.* Check microphone, cable, T101. *f.* Check and trouble shoot –42-volt supply and divider (R147–R150).
2. Low or zero modulator output, PHONE operation; METER switch set to MOD, VOL EXP switch (S102) and CLIP-FILT switch (S103) both OFF.	2. *a.* MOD gain control misadjusted. *b.* Defective tube. *c.* High modulator grid bias. *d.* Defective modulator stage. *e.* Defective audio stage.	2. *a.* Readjust control. (See Section 4, par. 2.) *b.* Check V105, V106, V104, V108. *c.* Check and trouble shoot –42-volt supply and divider (R147–R150) *d.* Trouble shoot circuits. *e.* Trouble shoot 2nd and 3rd audio amplifier stages.
3. Same as Symptom 2, except CLIP-FILT switch (S103) ON.	3. *a.* Defective clipper. *b.* Defective audio filter.	3. *a.* Check V103; trouble shoot circuit. *b.* Replace Z101.
4. Zero or low volume-expansion indication; VOL EXP switch (S104) ON, METER switch set to VOL EXP.	4. *a.* EXP control misadjusted. *b.* Defective tube. *c.* Defective volume-expander circuit.	4. *a.* Readjust control. (See Section 4, par. 2.) *b.* Check V107, V108, V109, V104. *c.* Check volume-expander multivibrator, rectifier, clamp.

TABLE 7—3. AUDIO CIRCUITS TROUBLE-SHOOTING CHART (Cont)

SYMPTOM	PROBABLE TROUBLE	CORRECTIVE MEASURE
5. Abnormally high volume-expansion indication; VOL EXP switch (S104) ON, METER switch set to VOL EXP.	5. *a.* Defective tube. *b.* Defective component at keyed or filtered 300-volt lines. *c.* Defective meter circuit.	5. *a.* Check V104, V105, V106, V101, V102. *b.* Trouble shoot circuits, especially C127, C116. *c.* Check shunt resistor R401.
6. Low or zero modulator output, MCW operation; METER switch set to MOD.	6. *a.* MCW modulation-level control (R141) misadjusted. *b.* Defective MCW oscillator.	6. *a.* Readjust R141. (See par. 5*c*, this section.) *b.* Check V109; trouble shoot oscillator circuit.
7. No side-tone audio output at EARPHONES jack.	7. *a.* EARPHONE LEVEL control misadjusted. *b.* Monitoring circuit defective.	7. *a.* Readjust control for normal volume. *b.* Check J402, R411, T101, K401A.

g. TROUBLE SHOOTING CONTROL AND POWER CIRCUITS.—If the symptoms of table 7–1 (or tables 7–2 and 7–3) indicate that the control or power circuits are at fault, those circuits can be checked directly from the schematic diagram, figure 7–28. The voltage and resistance measurements indicated in figures 7–3, 7–4, and 7–5 will also be of value in isolating the defective circuit or components. As explained previously, the power and control circuits are checked by tracing voltages, checking circuit continuity, etc., starting at the output of the control circuit or rectifier presumed to be faulty. No individual trouble-shooting chart is supplied for these circuits, since there are no visible symptoms of faulty operation, other than those which are incorporated in tables 7–1 through 7–3.

Many of the supply voltages may be checked conveniently at the terminals of the front-panel meter rather than at the less accessible connectors and terminal points. The approximate voltages which should be obtained for the pertinent METER switch

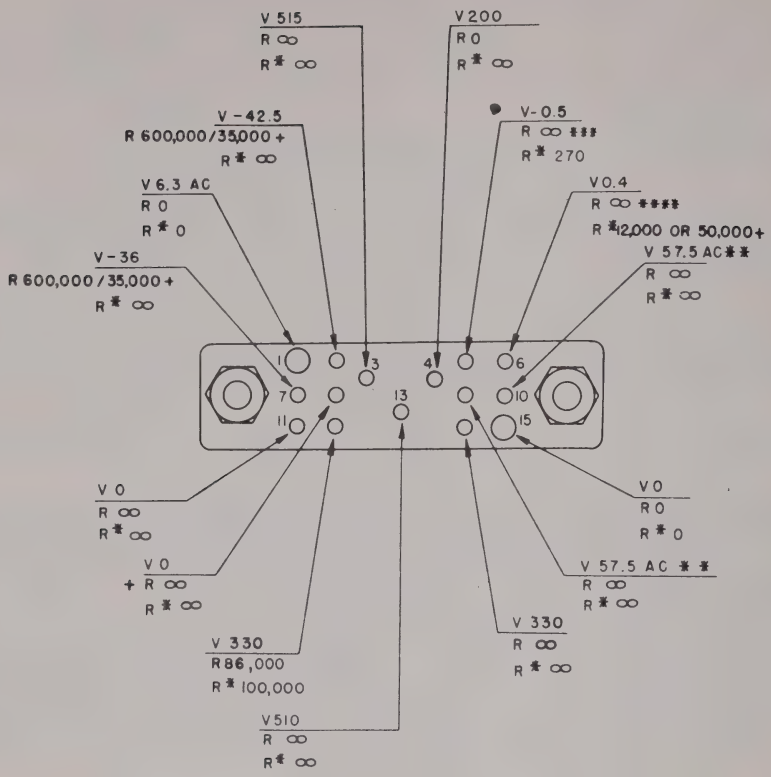


NOTES:
VOLTAGE MEASUREMENTS TAKEN WITH AMP-OSC AND RADIO MOD UNITS CONNECTED AND OPERATING. CARRIER FREQ.- 115 MC. RESISTANCE MEASUREMENTS TAKEN WITH AMP-OSC AND RADIO MOD UNITS DISCONNECTED. R INDICATES DC RESISTANCE TO GROUND. V INDICATES VOLTAGE READINGS TAKEN TO GROUND, USING A 1000 OHM-PER-VOLT VOLTMETER WHOSE MAX. SCALE READING IS NOT MORE THAN APPROXIMATELY THREE TIMES THE VALUE GIVEN.

† AC MEASURED TO PIN 4.

VOLTAGES NOT OTHERWISE INDICATED ARE DC.

Figure 7—3. Power Supply PP-773/URT, Tube Socket Voltages and Resistances



AMP–OSC JACK (J601)

POWER SUPPLY PLUG (P402)

NOTES: ALL VOLTAGES APPLY TO ACTUAL READINGS OBTAINED WHEN USING A 1,000 OHM-PER-VOLT VOLTMETER WHOSE MAXIMUM SCALE READING IS NOT MORE THAN APPROXIMATELY THREE TIMES THE VALUE GIVEN.

R INDICATES DC RESISTANCE FROM CONTACTS OF P402 TO CHASSIS GROUND WITH AMP-OSC AND RADIO MOD UNITS DISCONNECTED FROM POWER SUPPLY

R* INDICATES DC RESISTANCE FROM CONTACTS OF J601 TO CHASSIS GROUND WITH AMP-OSC DISCONNECTED FROM POWER SUPPLY.

V INDICATES VOLTAGE READINGS TAKEN TO GROUND UNLESS OTHERWISE NOTED, WITH AMP-OSC CONNECTED THROUGH PATCH CORD TO POWER SUPPLY. NORMAL "CARRIER ON" OPERATION AT 115 M C. MODULATOR SWITCHES AND FRONT PANEL CONTROLS IN POSITIONS GIVEN IN FIG. 7–13.

VOLTAGES NOT OTHERWISE INDICATED ARE D C.

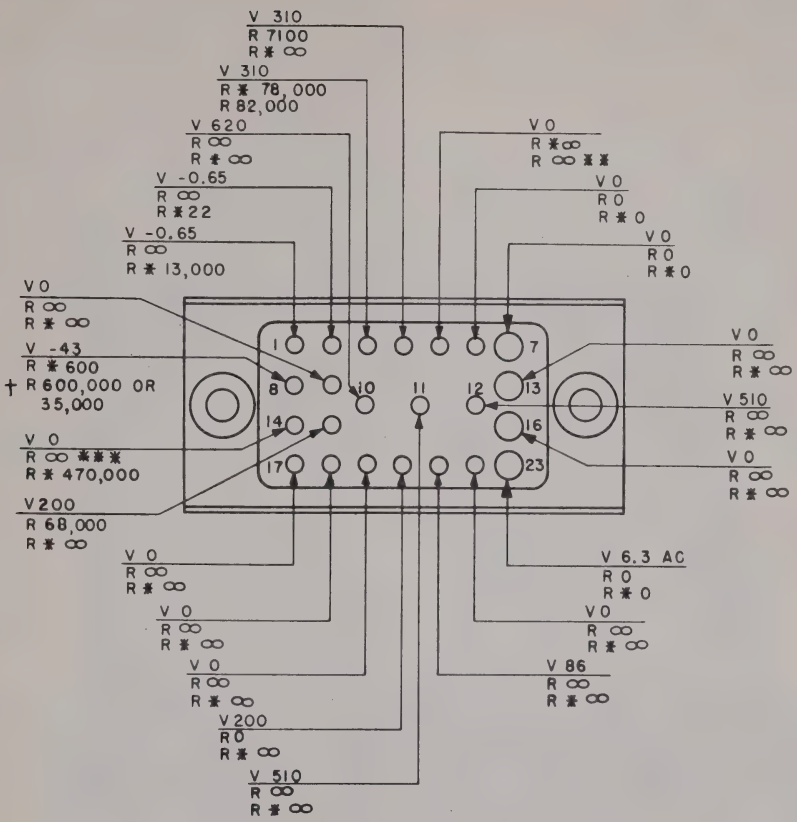
† DEPENDS ON POLARITY.

** 115 AC BETWEEN PINS 9 AND 10.

*** 8,000 WITH METER SWITCH IN DOUBLER I_g POSITION.

**** 8,000 WITH METER SWITCH IN OUTPUT POSITION.

Figure 7–4. Amplifier-Oscillator Power Connectors (P402 and J601), Terminal Voltages and Resistances



RADIO MODULATOR JACK (J101)

POWER SUPPLY PLUG (P401)

NOTES: R INDICATES DC RESISTANCE FROM CONTACTS OF P401 TO CHASSIS GROUND WITH AMP-OSC AND RADIO MOD UNITS DISCONNECTED FROM POWER SUPPLY.

R ✱ INDICATES DC RESISTANCE FROM CONTACTS OF J101 TO CHASSIS GROUND WITH RADIO MOD UNIT DISCONNECTED FROM POWER SUPPLY.

V INDICATES VOLTAGE READINGS TAKEN TO GROUND WITH MODULATOR UNIT CONNECTED THROUGH PATCH CORD TO POWER SUPPLY. NORMAL "CARRIER ON" OPERATION AT 115 MC. MODULATOR SWITCHES AND FRONT PANEL CONTROLS IN POSITIONS GIVEN IN FIG. 7-13.

ALL VOLTAGES APPLY TO ACTUAL READINGS OBTAINED WHEN USING A 1,000 OHM-PER-VOLT VOLTMETER WHOSE MAXIMUM SCALE READING IS NOT MORE THAN APPROXIMATELY THREE TIMES THE VALUE GIVEN.

VOLTAGES NOT OTHERWISE INDICATED ARE DC.

† DEPENDS ON POLARITY.

✱✱✱ 8000 WITH METER SWITCH IN AVG POSITION

✱✱ 8000 WITH METER SWITCH IN MOD POSITION.

Figure 7–5. Radio Modulator Power Connectors (P401 and J101), Terminal Voltages and Resistances

(S401) positions are as follows:

TRIPLER I_g	–42.5 volts
PA I_g	–42.5 volts
TRIPLER I_p	+515 volts
PA I_p	+515 volts
VOL EXP	+310 volts (keyed)

In the event of zero or low output voltages, check first the rectifier tubes (V401, V402) or the selenium rectifiers (CR401, CR402), depending on the voltage which is not of proper value. Then check filter capacitors for opens, shorts, and leakage, and resistors for opens or changes in value. Other possibilities are defective transformers and filter chokes. The locations of the various components on the Power Supply chassis are shown in figures 7–6, 7–7, and 7–8. However, maintenance personnel are cautioned not to restrict trouble shooting to those components on the main chassis; it is entirely possible that the defective components may be located within the other units of the equipment. The resistance measurement procedures described in figures 7–4 and 7–5 are intended to aid in the isolation of the defective circuit to one of the major units.

b. TROUBLE SHOOTING R-F CIRCUITS.—If faulty operation of the r-f circuits in the Amplifier-Oscillator unit is indicated, the trouble-shooting chart of table 7–2 should be used. Isolation of the source of faulty operation to a particular stage is made relatively simple by the six positions of the METER switch (S401) which allow the meter to monitor the r-f stages. Once the trouble has been isolated to an individual stage, by means of the meter readings and table 7–2, the defective component can usually be determined by checking tubes and taking voltage and/or resistance measurements. Figure 7–9 indicates the readings which should be obtained at the tube sockets, while those which should be present at connector J601 appear in figure 7–4. It should be noted, how-

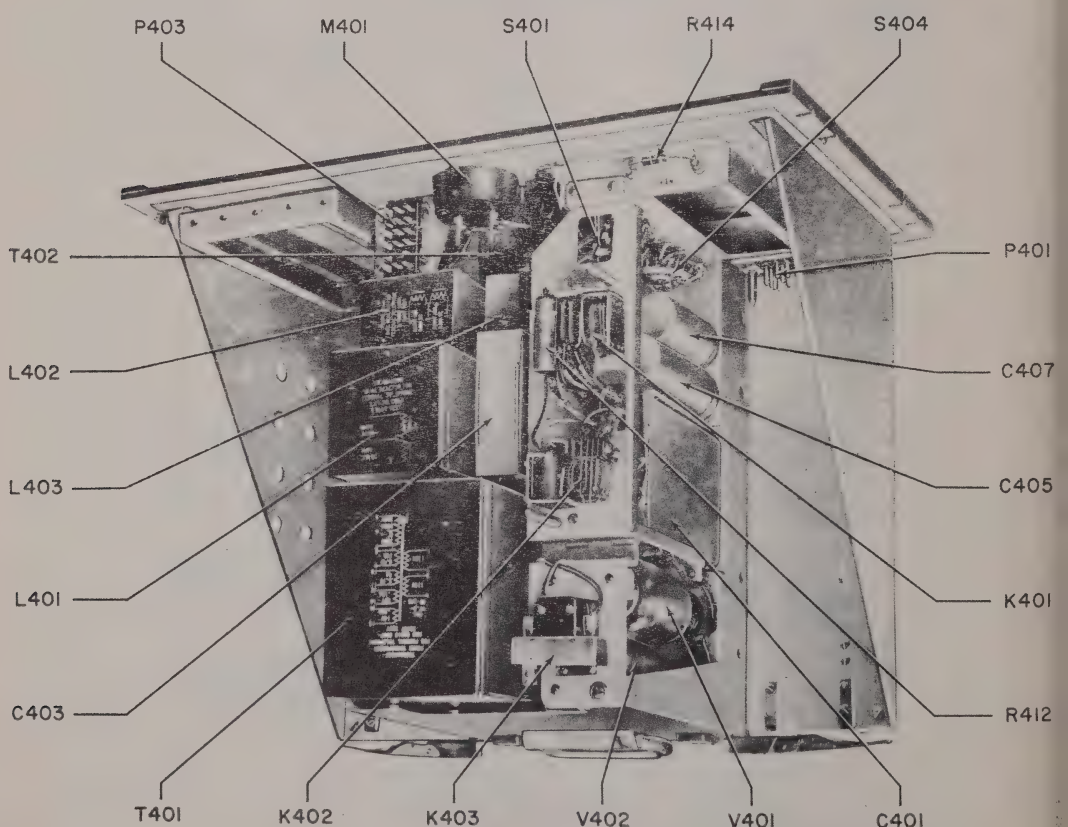


Figure 7–6. Power Supply PP-773/URT, Top View

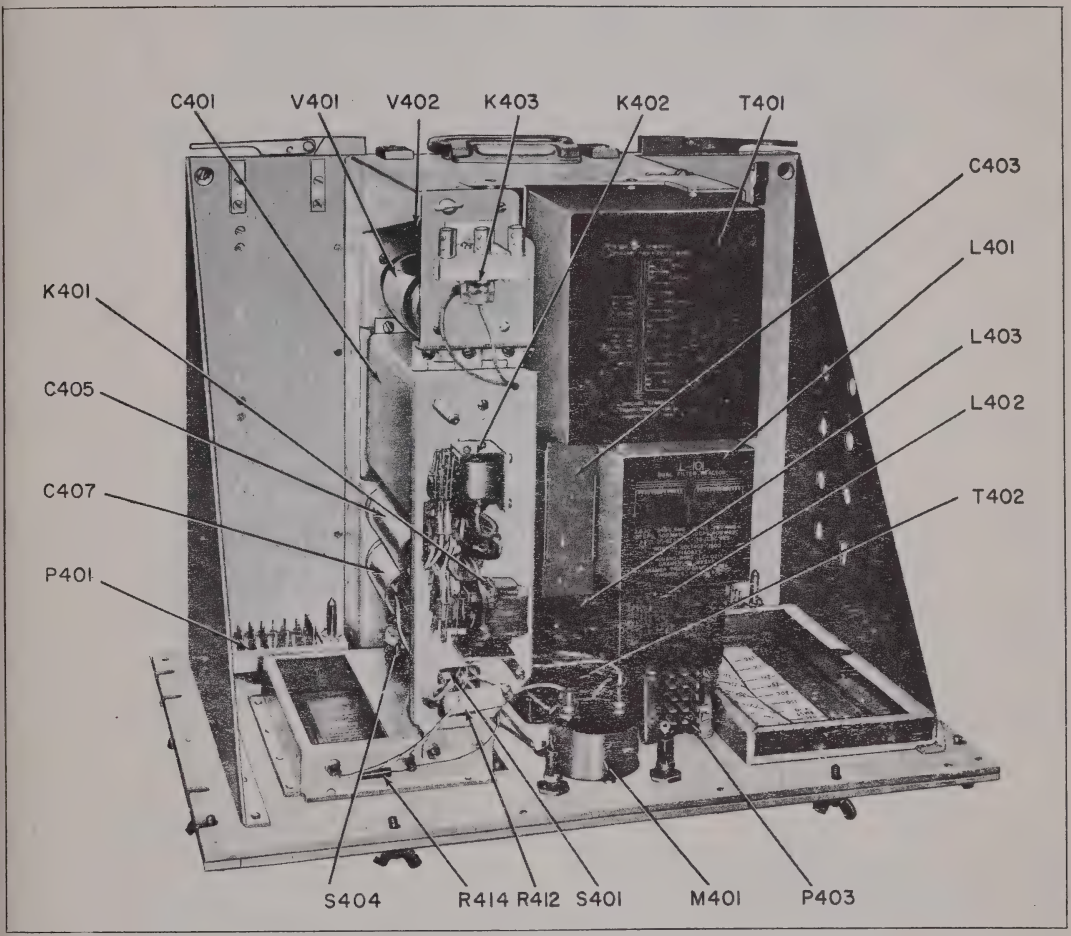


Figure 7—6A. Power Supply PP-773B/URT, Top View

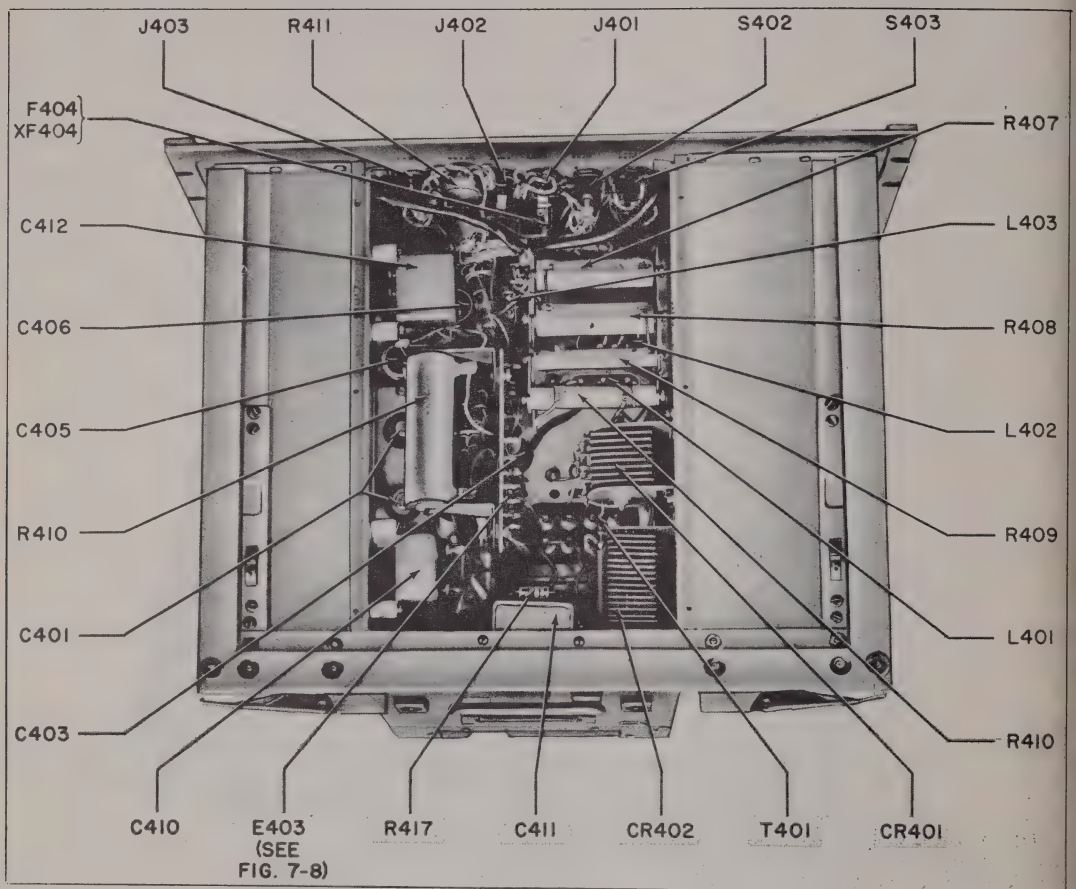


Figure 7–7. Power Supply PP-773/URT, Bottom Cover Plate Removed

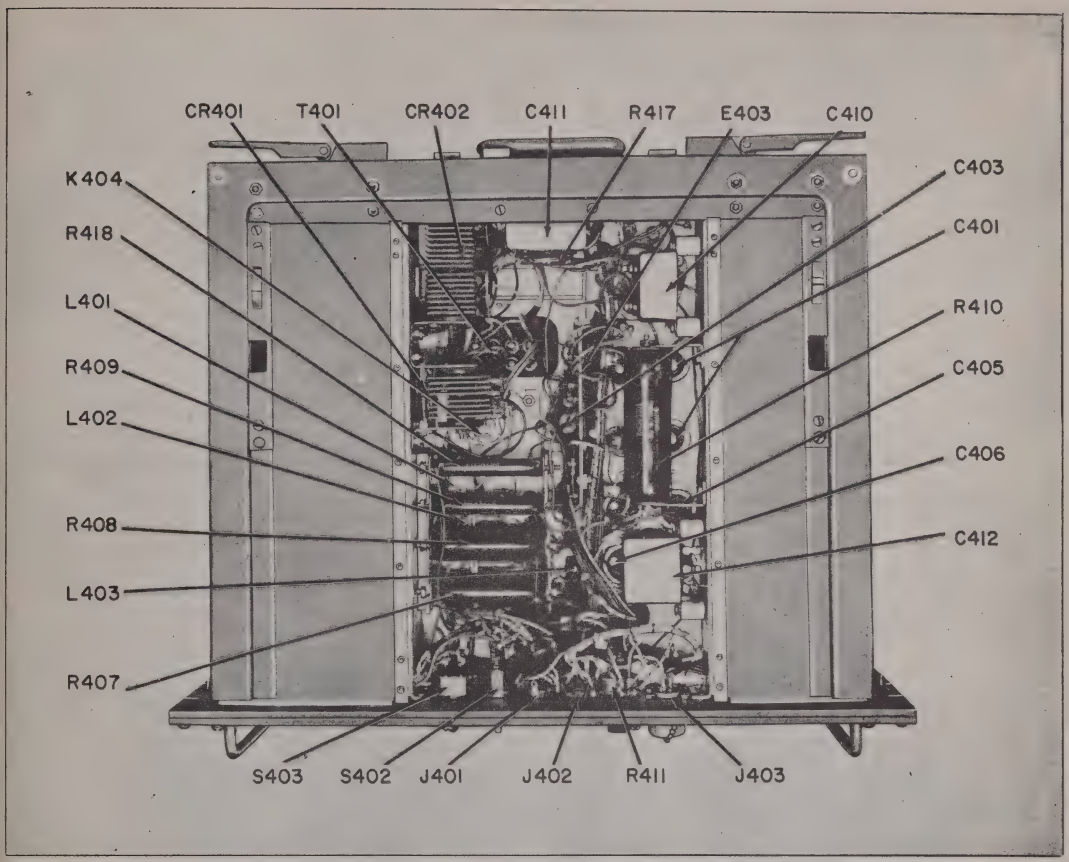


Figure 7—7A. Power Supply PP-773B/URT, Bottom Cover Plate Removed

ever, that the most likely causes of trouble are defective tubes and misalignment of the r-f circuits; both of these items should be checked prior to any other trouble-shooting procedure. The alignment adjustments are described in paragraph 4 of this section.

If any of the ceramic feed-through capacitors used throughout the r-f circuits break down, it will usually be evidenced by discoloration of the capacitor. A defective component of this type can be located visually; it may also give rise to the appearance of parasitic oscillations. Such spurious frequencies may result in unstable operation, poor power output, high transmitted noise level or hum, or other symptoms of improper operation not immediately traceable by meter readings or measurements. Refer to paragraph 3 of this section for additional information regarding repair and replacement of r-f components.

The locations of the various components in the Amplifier-Oscillator unit are shown in figures 7–10, 7–11, and 7–12. The illustrations of the subassemblies, figures 7–22, 7–23, and 7–24, may also be of value in this respect.

i. TROUBLE SHOOTING AUDIO CIRCUITS.—Table 7–3 provides trouble-shooting information for the audio circuits, most of the components of which

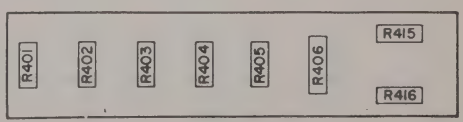
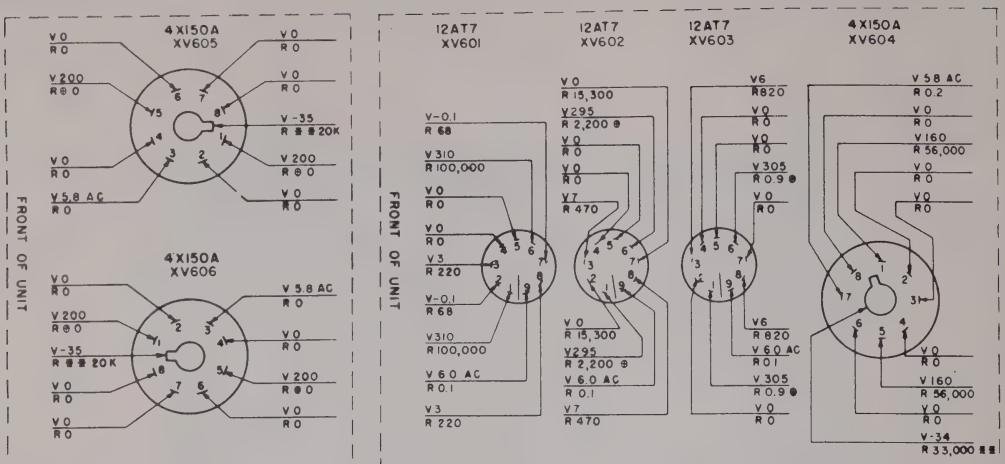


Figure 7—8. Terminal Board E403



NOTES

R INDICATES DC RESISTANCE TO GROUND, UNLESS OTHERWISE NOTED.

V INDICATES VOLTAGE READINGS TO GROUND. AMP-OSC CONNECTED THROUGH PATCH CORD TO POWER SUPPLY. EQUIP'T IN NORMAL "CARRIER-ON" OPERATION AT 115 MC. ALL VOLTAGES APPLY TO ACTUAL READINGS OBTAINED WHEN USING A 1000 OHM-PER-VOLT VOLTMETER WHOSE MAXIMUM SCALE READING IS NOT MORE THAN APPROXIMATELY THREE TIMES THE VALUE GIVEN.

MODULATOR CONTROLS AND SWITCHES IN POSITIONS GIVEN IN FIG. 7-13.

VOLTAGE READINGS NOT OTHERWISE INDICATED ARE DC.

Figure 7–9. Amplifier-Oscillator AM-638/URT, Tube Socket Voltages and Resistances

are in the Radio Modulator unit. Although the MOD, AVC, and VOL EXP positions of the METER switch (S401) permit the meter to partially check these circuits, the indications so obtained are not as complete or conclusive as those for the r-f circuits. For that reason, it is extremely important that the sequential procedure of table 7–3 be followed in order to quickly isolate the trouble to a particular stage or group of stages. The most likely sources of faulty operation are defective tubes and improper adjustment of the various operating and nonoperating controls and switches. Check and replace all tubes which are weak or bad, or substitute tubes which are known to be good. Be certain that the screwdriver-adjusted controls within the unit are set correctly; refer to paragraph 5, this section. If no modulation meter reading is obtained in the MOD position of the METER switch (S401), *always* check the modulator-plate fuse (F403) before performing any other tests.

If it becomes necessary to check voltages and resistances in order to locate a defective component, follow the measurement procedure described in the tube-socket diagram, figure 7–13. The readings which should be obtained are indicated in that illustration, while those which should appear at connector J101 are shown in figure 7–5. The components of the Radio Modulator may be identified from figures 7–14 through 7–19, inclusive.

3. REPAIR AND REPLACEMENT OF R-F COMPONENTS.

a. GENERAL INSTRUCTIONS.–The repair and replacement of certain of the r-f components used in the Amplifier-Oscillator unit require careful and accurate workmanship. This is especially true of those components and assemblies which are mechanically complex or which are specially designed for high-frequency application. The material which follows is intended to allow repairs or replacements to be made with a minimum of effort and to preclude the possibility of damage to other components.

b. PA SCREEN BYPASS CAPACITOR, C642. *(See figure 7–20.)*—The dielectric used in capacitor C642 is Teflon, which is cut to cover almost the width of the upper shelf of the unit, so the one piece will serve for both tubes (V605 and V606) of the power amplifier stage. The chassis and a cover plate are used as one side of the capacitor with the dielectric material between them and the screen-contact plate, which also acts as the other side of the capacitor. The screen-contact plate is placed above the Teflon,

the plate being cut somewhat narrower than the dielectric. The circumference of the holes in the plate through which the tubes pass is ringed with contact springs. These springs press against the screen-connecting ring on the tube, assuring good electrical contact. Above the contact plate is placed an additional strip of Teflon, topped by the metal ground plate. The tube holes in this plate are cut larger than in the Teflon or screen-contact plate to avoid having the springs of the contact plate ground out the screen grid. The ground for the top plate is made through spring assemblies which are riveted to the plate, the springs pressing against the chassis making the ground connection. The mounting hardware also provides a ground path for the upper plate. Four of the mounting screws are put in from the top of the chassis and secured with lockwashers and nuts underneath the shelf. The two inner mounting screws are soldered in place from underneath the chassis and the lockwashers and nuts applied from the top. The screen-contact plate has oversize holes drilled through it to prevent the screws from shorting the screen grid to ground.

When replacing the elements of this capacitor, line up the lower Teflon dielectric, the screen-contact plate, the remaining Teflon strip, and the cover (ground) plate concentric with the tube sockets. The two screws which are soldered in place under the shelf plate should be lined up in the center of their mounting and clearance holes. The four remaining holes should line up accordingly. The screw holes in the screen-contact plate are oversize to prevent the plate from shorting to ground.

CAUTION

Before tightening the mounting screws, the 4X150A tubes should be placed in the tube sockets to properly position the screen-connecting plate while tightening the mounting screws.

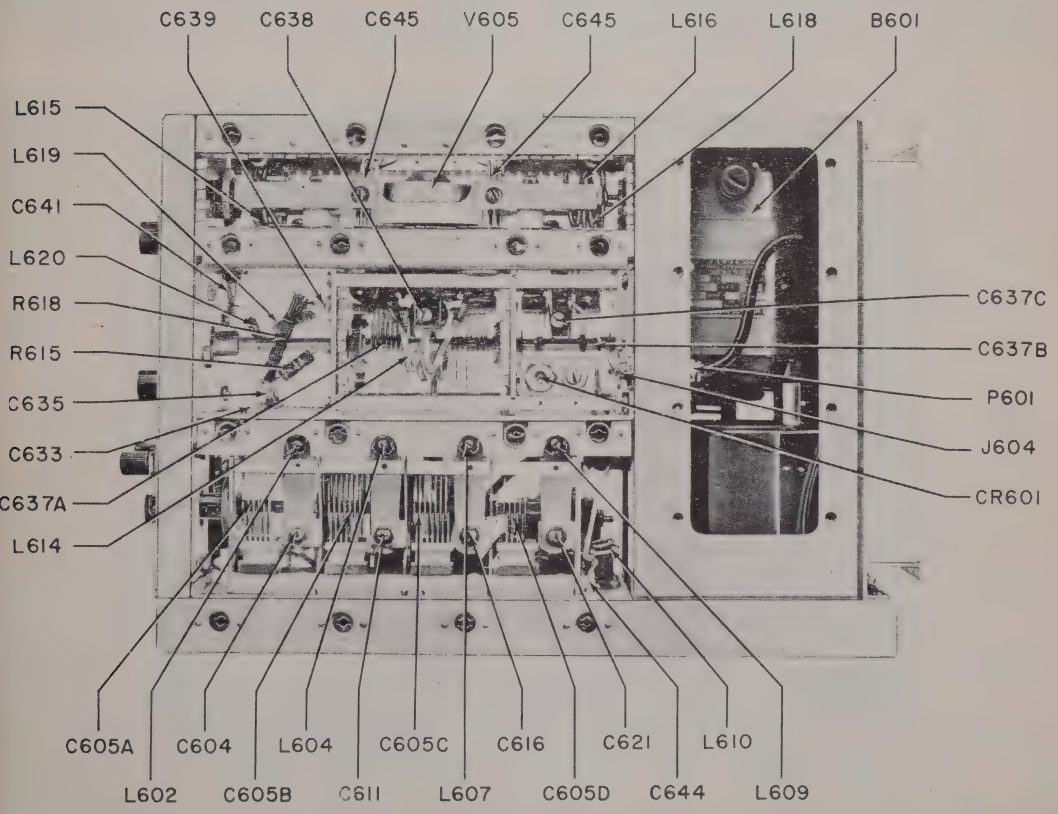


Figure 7—10. Amplifier-Oscillator AM-638/URT, Right Side Panels Removed

PA SCREEN BYPASS CAPACITOR, C642.1. On Model AM-638B/URT the construction of the power amplifier bypass capacitor is very similar to that of the second doubler capacitor, except that Teflon is used as the dielectric and the elements are cut to almost cover the width of the upper shelf so that one piece will serve for both tubes (see figure 7-20). The ground for the brass cover plate is made through spring assemblies which are riveted to the plate. The springs press against the chassis for ground connection. The mounting hardware provides an additional ground path for the cover plate. Four of the mounting screws are put in from the top of the chassis and secured with lockwashers and nuts applied from the top. The screen contact ring has oversize holes drilled through it to prevent the screws from shorting the screen grid to ground.

When replacing elements of this capacitor, line up the lower Teflon, the screen contact ring, the upper Teflon, and the cover plate properly with the tube sockets. The two screws which are soldered in place under the shelf plate should be lined up in the center of their mounting and clearance holes. The four remaining screws should line up accordingly.

Note

Before tightening the mounting screws, place the 4X150A tubes in their sockets. Tighten the mounting screws while the screen contact ring is thus properly aligned.

c. TRIPLER SCREEN BYPASS CAPACITOR, C619.—The construction of the tripler screen bypass capacitor, C619, is shown in figure 7-21. Mica dielectric is used in this capacitor, the elements of which are cut to fit the tripler tube, V604. Four mounting screws are used to secure the assembly and provide the ground contact for the cover plate. Two of these mounting screws enter from underneath the shelf plate and are screwed into threaded stand-off insulators. The remaining two enter from the top of the chassis plate and are secured underneath with lockwashers and nuts. The stand-off insulators are used to support the plate-clamping ring for the 4X150A tube used in the tripler.

When assembling capacitor C619, line up the insulators, the contact plate and the cover plate concentric with the tube socket. The four corner holes in each item should then line up. The screen-contact

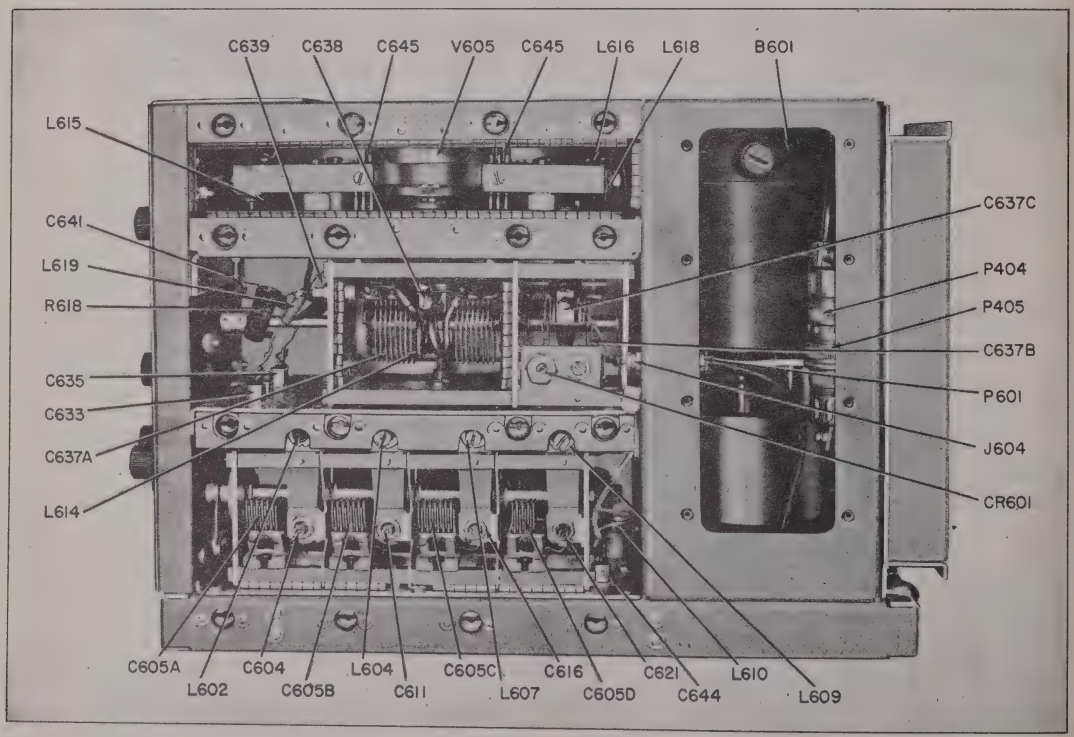


Figure 7—10A. Amplifier-Oscillator AM-638B/URT, Right Side Panels Removed

plate must be lined up so that the mounting screws are in the center of their clearance holes and do not touch the plate. The clearance holes in the contact plate are oversize and should be concentric with the screws when the screws are tightened.

TRIPLER SCREEN BYPASS CAPACITOR, C619. On Model AM-638B/URT, careful work is required when repairing screen bypass capacitors C619.1 in the tripler stage and C642.1 in the power amplifier.

(1) If it becomes necessary to remove or repair the tripler bypass capacitor C619.1 (see figures 7-11 and 7-21), it can be removed as follows:

(a) Remove the left side plate and bottom cover plate of the r-f section by loosening the eight camloc fasteners on the side and by removing the fifteen screws from the bottom.

(*b*) Remove V604 as described in section 5, paragraph 2*b*.

(*c*) Disconnect capacitor C618 from the driver plate clamp.

(*d*). Remove the two stand-off insulators (with clamp attached) by unscrewing the two holding screws from underneath the chassis. It is not necessary to disassemble the driver clamp and attached spacer insulators to service capacitor C619.1, but for purpose of clarity the complete disassembly is shown in exploded view in figure 7-21.

Mica is used as the dielectric material in this capacitor. The elements of the capacitor are cut wide enough so that the 4X150A tube fits inside the capacitor. The chassis and brass cover plate form one side of the capacitor, with the mica dielectric material between them and the screen contact ring acting as the other plate of the capacitor. The screen contact ring is cut somewhat smaller than the dielectric and is mounted above the mica. The circumference of the hole in the screen contact ring, through which the tube passes, is ringed with contact springs. These springs press against the screen connecting ring of the tube (when the tube is inserted) and assure good electrical contact. Above this screen contact ring is the second piece of mica, topped by a brass cover plate. Four mounting screws are used to secure the assembly and to provide ground contact for the cover plate. Two of these mounting screws enter from underneath the shelf plate and are screwed into stand-off insulators. The remaining two enter from the

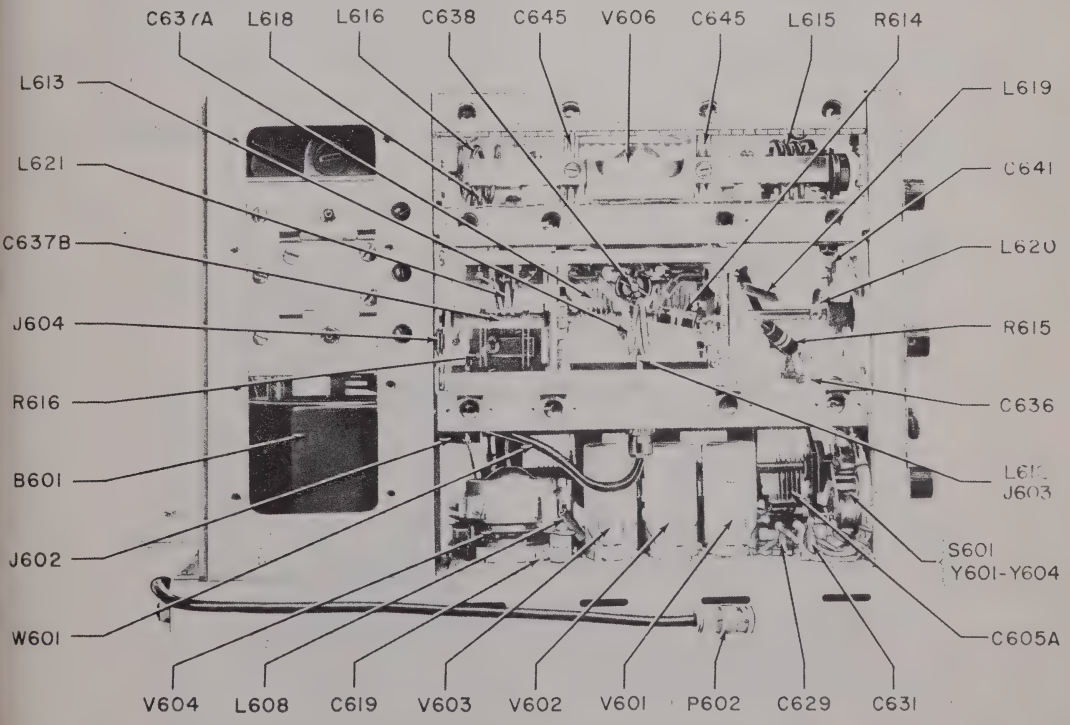


Figure 7—11. Amplifier-Oscillator AM-638/URT, Left Side Panels Removed

top of the chassis plate and are secured underneath with lockwashers and nuts.

When reassembling capacitor C619.1, align the insulator contact ring, and the cover plate concentric with the tube socket in their original order. The four corner holes in each item should then line up. The screen contact ring must always be aligned so that the mounting screws are in the center of their clearance holes and do not touch the ring. The clearance holes in the contact ring are oversize and should be concentric with the screws when the screws are tightened.

d. TUNING DRIVES.—If trouble, such as slippage or excessive backlash, is encountered in any of the tuning drives, it may be necessary to remove and replace the defective assembly. Instructions for replacement are as follows:

(1) Loosen the Camloc fasteners and remove the side plates. Remove all crystals from the CRYSTAL SELECTOR switch (S601).

(2) Using the No. 6 Allen-head setscrew wrench (H102), mounted on the front panel of the Radio Modulator unit (see figure 1-4), remove and tag all front-panel dials, indicators, and knobs, *except* the CRYSTAL SELECTOR control, which is an integral part of the front-panel assembly.

Note

Use a 1/16-inch diameter drive-pin punch to remove the tapered pins in the tuning-lock knobs.

(3) Remove all screws around the sides and top of the front panel.

(4) Take off the front panel.

(5) At this point, excessive backlash or mechanical damage can be detected visually.

(6) To remove any tuning drive, loosen the setscrews in the rigid mechanical coupling between the gear shaft and capacitor-bank shaft. Use the No. 6 Allen-head setscrew wrench, H102.

(7) The tuning drive may now be removed by removing the retaining screws on the rear plate.

(8) Reassembly procedure is similar to the preceding steps, but in reverse order. The tuning drive should first be mounted firmly, but not tightly, on its three mounting screws. The drive shaft should then be lined up with the capacitor shaft so that the coupling slides freely over the ends of both shafts. Tighten the coupling setscrew and then tighten the tuning-drive mounting screws. This assures perfect shaft alignment.

(9) Adjust and tighten coupling so that the gang capacitor is at maximum capacity when the tuning drive is against its stop.

(10) Align r-f circuits, as necessary. (See paragraph 4, this section.)

e. PA GRID AND OUTPUT FILTER TUNING CAPACITOR, C637.—If it should become necessary to replace or repair any part of capacitor C637, or to tighten or straighten any of the stator plate assemblies, removal of C637 from the Amplifier-Oscillator can be accomplished by the following steps (see figures 7-22 and 7-23):

(1) Loosen the Camloc fasteners and remove the side plates. Remove all crystals from the CRYSTAL SELECTOR switch (S601).

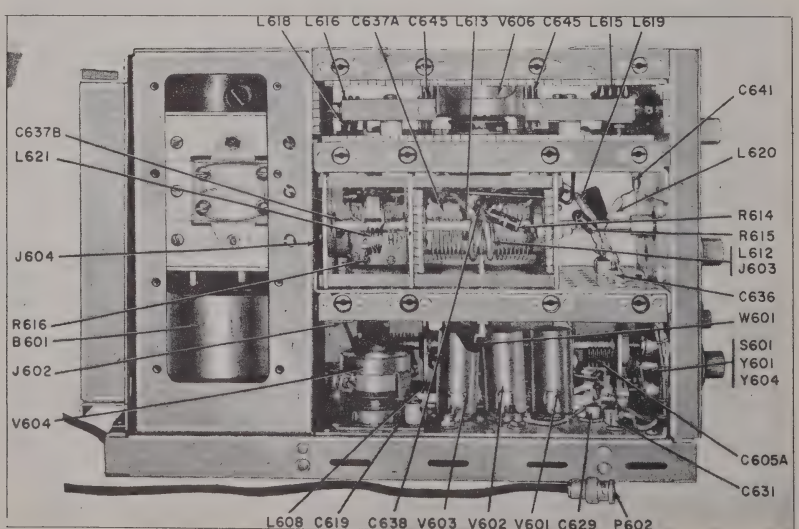


Figure 7—11A. Amplifier-Oscillator AM-638B/URT, Left Side Panels Removed

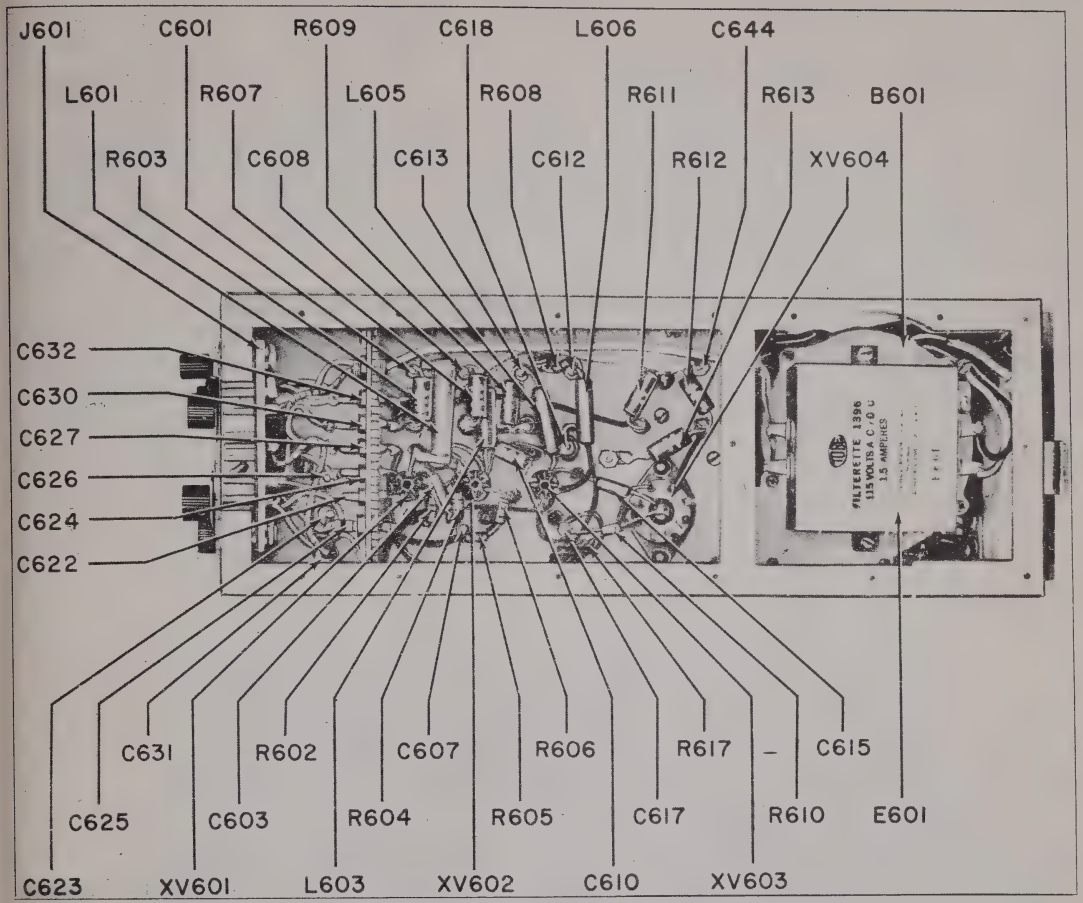


Figure 7—12. Amplifier-Oscillator AM-638/URT, Bottom Cover Plate Removed

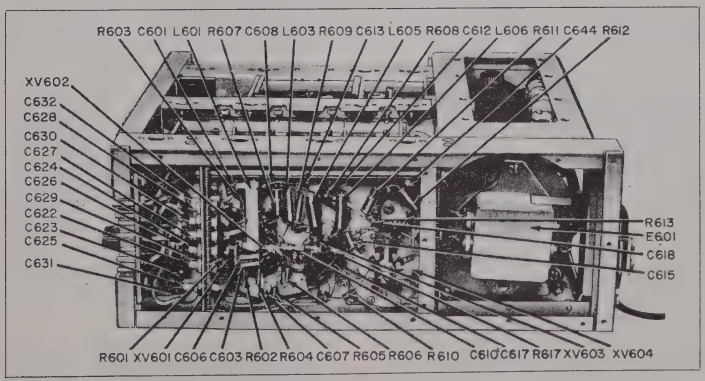


Figure 7—12A. Amplifier-Oscillator AM-638B/URT, Bottom Cover Plate Removed

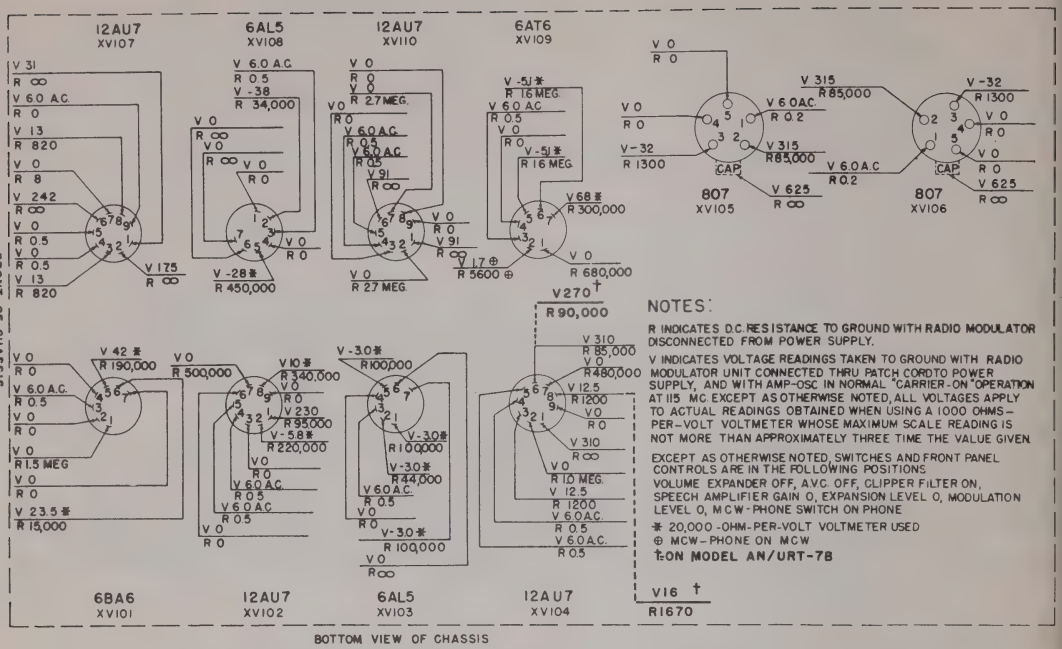

12AU7
XV107
6AL5
XV108
12AU7
XV110
6AT6
XV109
807
XV105
807
XV106
6BA6
XV101
12AU7
XV102
6AL5
XV103
12AU7
XV104
V16 †
R1670
FRONT OF CHASSIS
BOTTOM VIEW OF CHASSIS
NOTES:
R INDICATES D.C. RESISTANCE TO GROUND WITH RADIO MODULATOR DISCONNECTED FROM POWER SUPPLY.
V INDICATES VOLTAGE READINGS TAKEN TO GROUND WITH RADIO MODULATOR UNIT CONNECTED THRU PATCH CORD TO POWER SUPPLY, AND WITH AMP-OSC IN NORMAL "CARRIER-ON" OPERATION AT 115 MC. EXCEPT AS OTHERWISE NOTED, ALL VOLTAGES APPLY TO ACTUAL READINGS OBTAINED WHEN USING A 1000 OHMS-PER-VOLT VOLTMETER WHOSE MAXIMUM SCALE READING IS NOT MORE THAN APPROXIMATELY THREE TIME THE VALUE GIVEN.
EXCEPT AS OTHERWISE NOTED, SWITCHES AND FRONT PANEL CONTROLS ARE IN THE FOLLOWING POSITIONS
VOLUME EXPANDER OFF, A.V.C. OFF, CLIPPER FILTER ON, SPEECH AMPLIFIER GAIN 0, EXPANSION LEVEL 0, MODULATION LEVEL 0, M.C.W.-PHONE SWITCH ON PHONE
* 20,000-OHM-PER-VOLT VOLTMETER USED
⊕ MCW-PHONE ON MCW
†ON MODEL AN/URT-7B

Figure 7—13. Radio Modulator MD-163/URT, Tube Socket Voltages and Resistances

(2) Remove the six screws holding the top plate in place and remove the top plate assembly.

(3) Using the No. 6 Allen-head setscrew wrench (H102), mounted on the front of the Radio Modulator unit (see figure 1–4), remove and tag all front-panel dials, indicators, and knobs, *except* the CRYSTAL SELECTOR control, which is an integral part of the front-panel assembly.

Note

Use a 1/16-inch diameter drive-pin punch to remove the tapered pins in the tuning-lock knobs.

(4) Remove all screws around the sides and top of the front panel and take off the front panel.

(5) Loosen the setscrews in the rigid mechanical couplings between the P.A. TUNING and P.A. GRID TUNING drive shafts and the capacitor-bank shafts; slide the couplings back on their respective shafts. Use the No. 6 Allen-head setscrew wrench.

(6) Disconnect W601 from J603 to facilitate removal of electron tube V604.

(7) Remove all tubes and tube shields. Mark each tube and shield, so it may be replaced in the same socket.

(8) Set all capacitor gangs at maximum capacity.

(9) Unsolder the following connections:

(*a*) L620 at its junction to C636.
(*b*) R615 at its junction to C635.
(*c*) R618 at its junction to C633.
(*d*) L619 at its junction to C634.
(*e*) Lead to J604
(*f*) R616 at its junction to C643.

(10) Remove the two vertical contact fingers on the left side of the PA-plate compartment.

(11) Remove the vertical contact finger from the right side, rear, of the PA-plate compartment.

(12) Remove the screws, front and rear, holding the PA shelf.

(13) Slide the PA shelf assembly, including the PA-grid capacitor, the PA shelf, and the PA-plate tank, to the left. Be careful to lift the assembly clear of C643 in the center-rear compartment and to clear L612, the PA-grid input coupling coil.

(14) Detach the terminal-lug assembly, consisting of two joined solder lugs, from capacitor C637B by removing the screw and lockwasher from the front stator of the capacitor.

(15) Detach the lug which grounds the frame of C637C by removing the hardware at the left-hand end of L618. Do *not* unsolder the lug from the capacitor frame.

(16) Unsolder the following connections:
(*a*) Grid leads to XV605 and XV606.
(*b*) L618 at its junction to C637B.
(*c*) Filament connection to C639.
(*d*) Filament lead to pin 3 of XV606.

(17) Pull clear the filament lead from XV605 to XV606. (Note the position of this lead, as it must be replaced in the same position.)

(18) Remove the six screws holding the capacitor C637 to the PA shelf, being careful not to lose the spacers.

(19) Capacitor C637 can now be completely removed for service or replacement.

(20) The stators can be adjusted to position at this time, if desired, by loosening the screw holding the individual stators.

(21) To reassemble, perform the preceding steps in reverse order. Be certain to ground the lug soldered to the frame of C637C by securing it with the hardware which grounds the left end of L618. When tightening the couplings between the tuning drives and the capacitor shafts, each capacitor must be at maximum capacity when the tuning drive is against its stop.

(22) Align r-f circuits as necessary. (See paragraph 4, this section.)

f. R-F DRIVER TUNING CAPACITOR, C605.—If it should become necessary to replace or repair any part of C605, or to tighten or straighten any of the stator plate assemblies, removal of C605 from the Amplifier-Oscillator can be accomplished by the following steps (see figure 7–24):

(1) Follow steps (1) through (13) of paragraph 3*e*, this section, performing step (5) for all three tuning drives; refer to figures 7–22 and 7–23.

(2) Unsolder the leads to C633, C634, C635, C641, and C644.

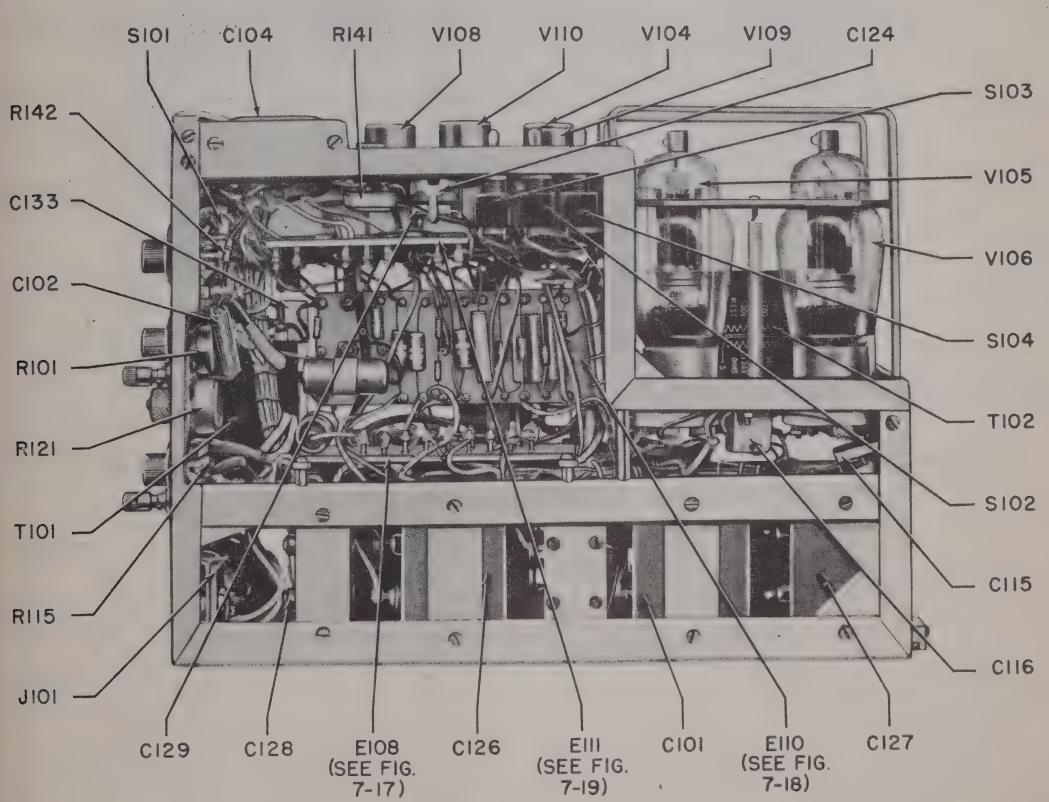


Figure 7–14. Radio Modulator MD-163/URT, Right Side View

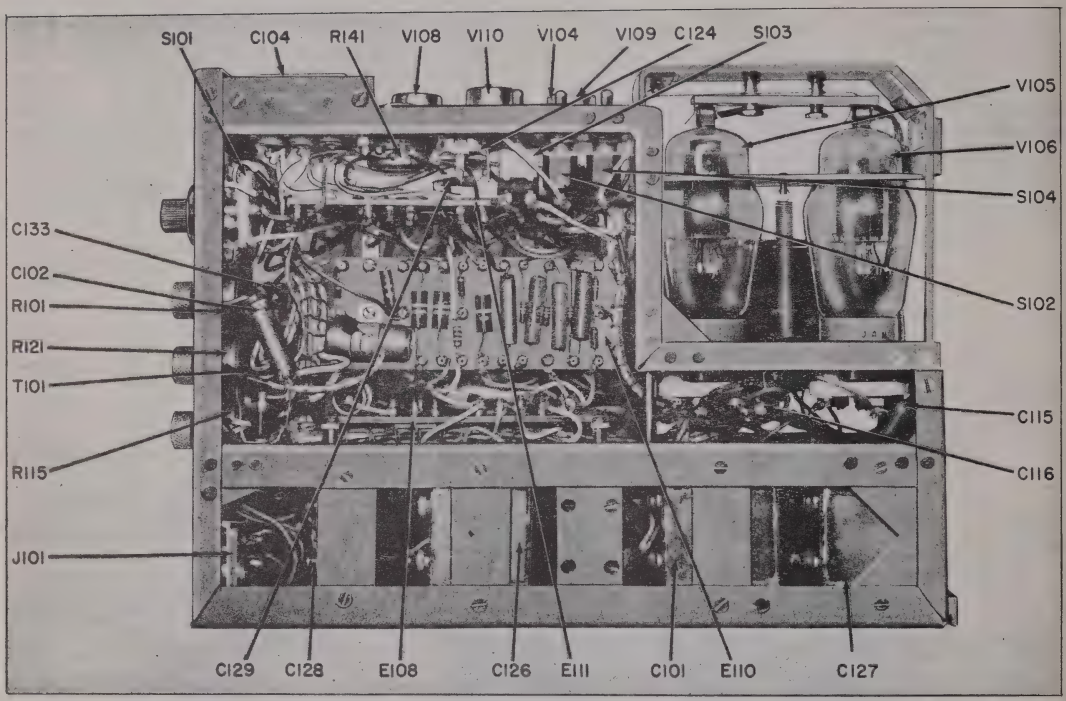


Figure 7—14A. Radio Modulator MD-163A/URT and MD-163B/URT, Right Side View

(3) Remove the screws which secure the intermediate shelf to the blower compartment at the rear and to the front frame. Remove the shelf by lifting the front end and sliding out.

(4) Remove W601 from J602.

(5) At this point, any of the driver tank coils (L602, L604, L607, L609, or L610) may be removed and replaced if such is required.

(6) Unsolder C602, C609, C614, and C620 from the stators of C605.

(7) Take out the 15 retaining screws which secure the bottom cover plate to the frame and remove the plate.

(8) Remove C605 by removing the three screws which hold it in position; the screws are accessible from the bottom of the driver shelf. Do not lose the spacers.

(9) To reassemble, perform the preceding steps in reverse order. When tightening the couplings between the tuning drives and the capacitor shafts, each capacitor must be at maximum capacity when the tuning drive is against its stop.

(10) Align r-f circuits, as necessary. (See paragraph 4, this section.)

g. MISCELLANEOUS REPAIR.—Because of the frequencies at which the r-f stages operate, care must be taken when replacing any components or leads. This is especially true insofar as the tripler-plate and power-amplifier circuits are concerned. The length and position of the leads in these stages are very critical. If any of the leads are to be replaced, they must be cut to the exact length of the original lead and placed as nearly as possible in the same position. Shortening or lengthening of any of these leads may

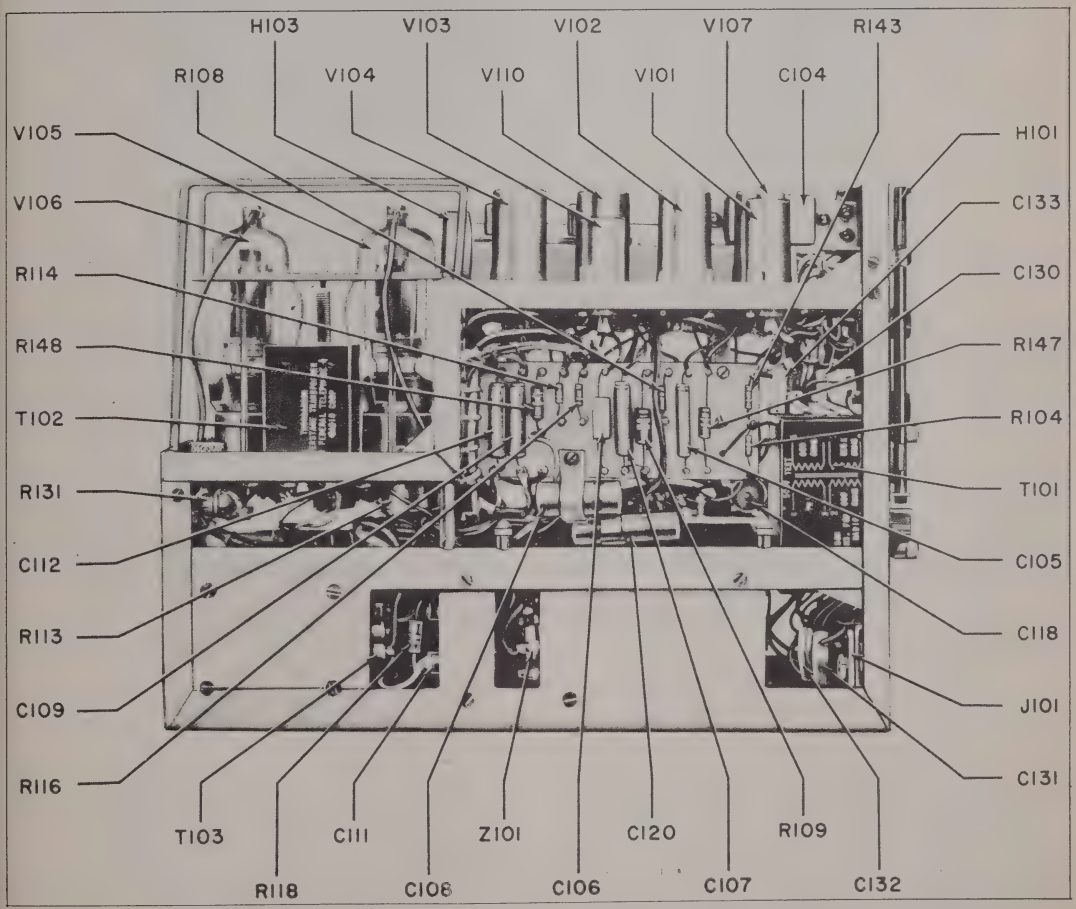


Figure 7—15. Radio Modulator MD-163/URT, Left Side View

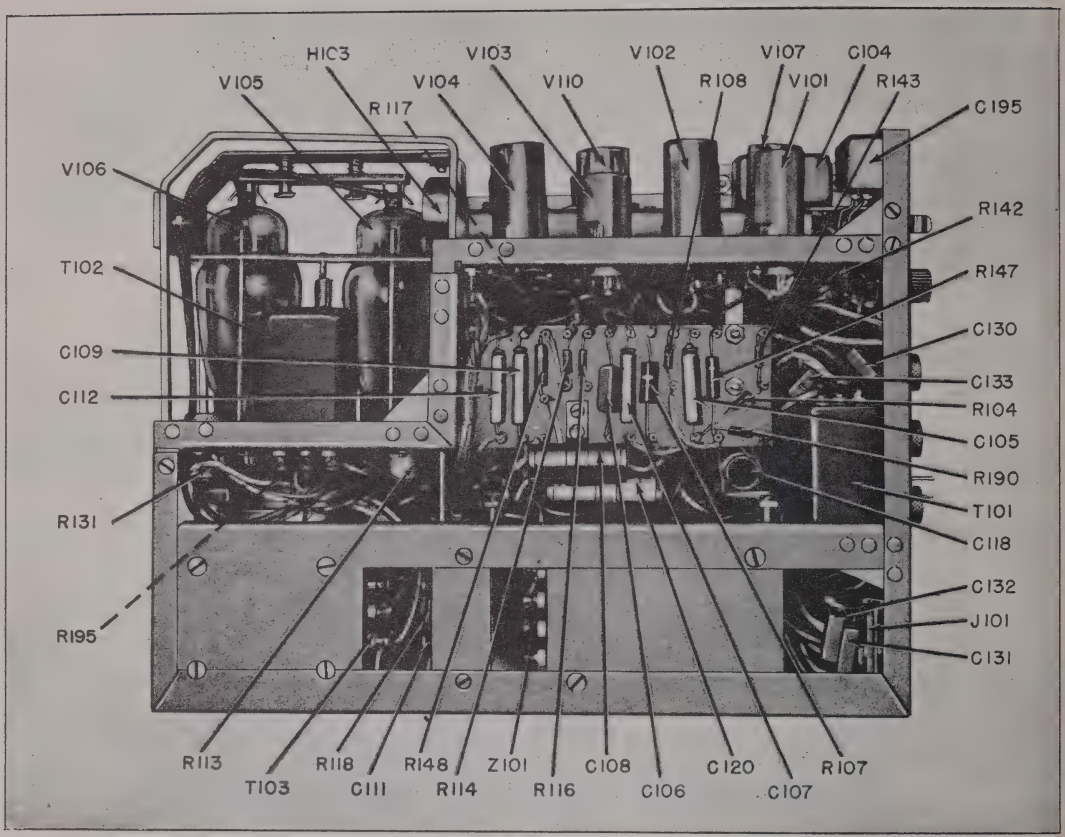


Figure 7—15A. Radio Modulator MD-163B/URT, Left Side View

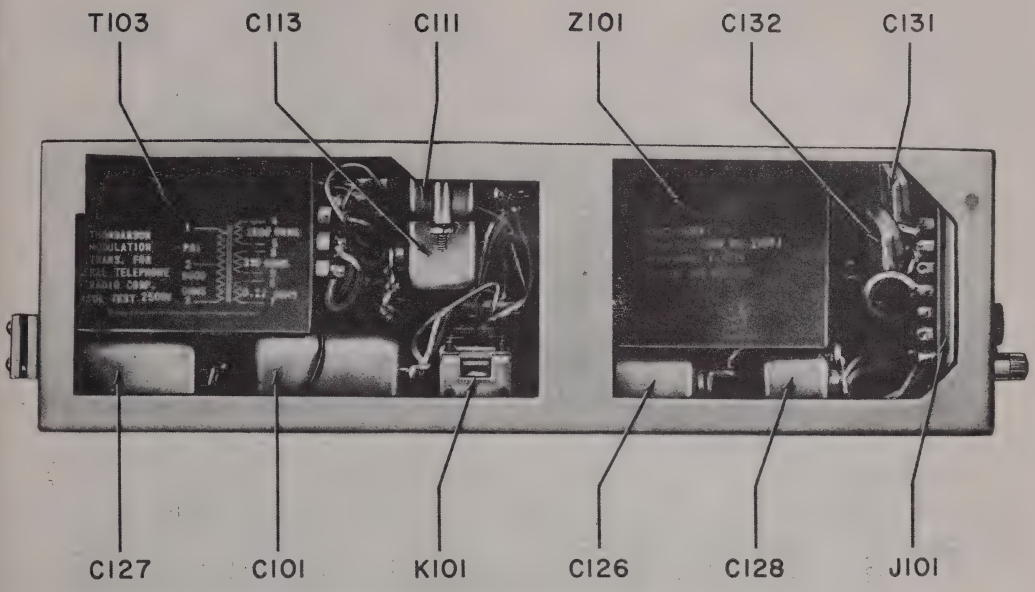


Figure 7—16. Radio Modulator MD-163/URT, Bottom View

make it impossible to track the r-f circuits. The indications that may be expected are these: lengthening a lead will result in reduction of tuning range and adjustment of the trimmer capacitor will not bring in the high end of the band. A shorter lead will allow the trimmer a greater range, but will cause trouble in trying to track both ends of the band. The middle range frequencies will also be difficult to track.

If it is necessary to replace any of the ceramic feed-through capacitors used in the r-f circuits, extreme care must be taken. These capacitors are extremely fragile; mechanical stress or overheating while soldering will result in damage to components of that type.

When making any repairs in the Amplifier-Oscillator, exercise care not to bend or otherwise damage the grounding contact fingers used in that unit. Should any of the fingers be out of line and not contacting the cover plates, the effective r-f shielding will be considerably reduced.

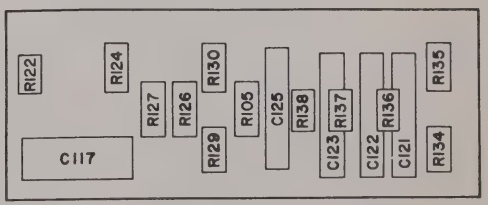


Figure 7—18. Terminal Board E110

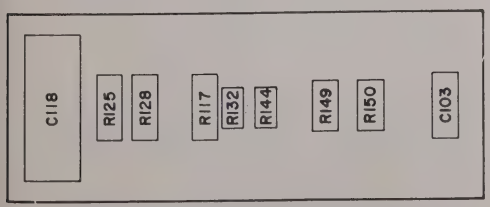


Figure 7—17. Terminal Board E108

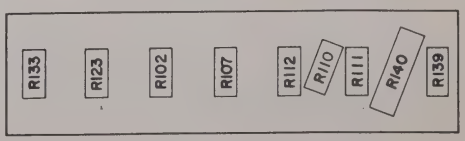


Figure 7—19. Terminal Board E111

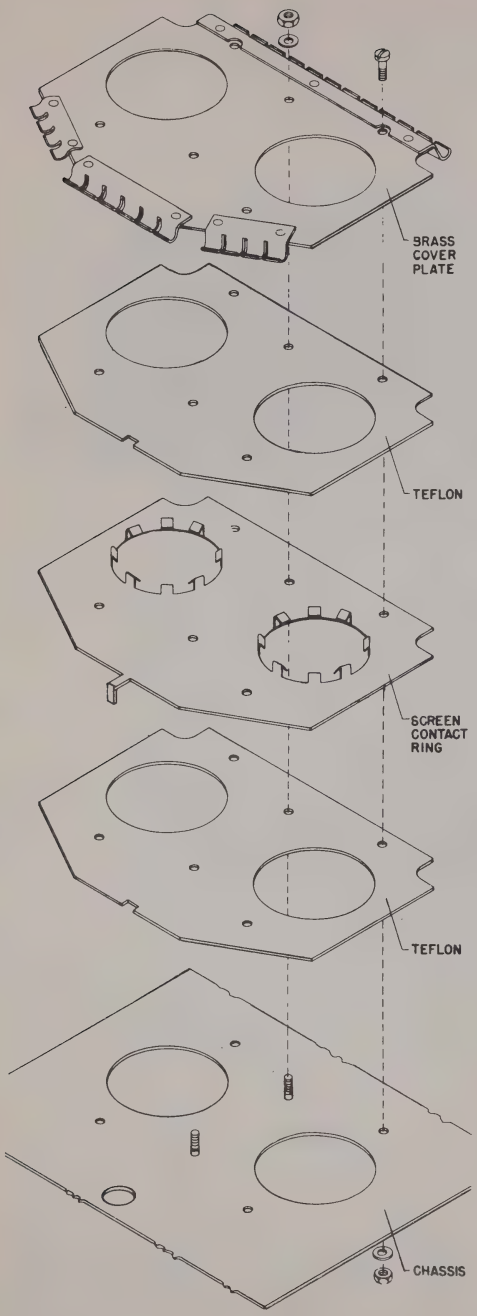


Figure 7–20. Power Amplifier Screen Bypass Capacitor, Exploded View

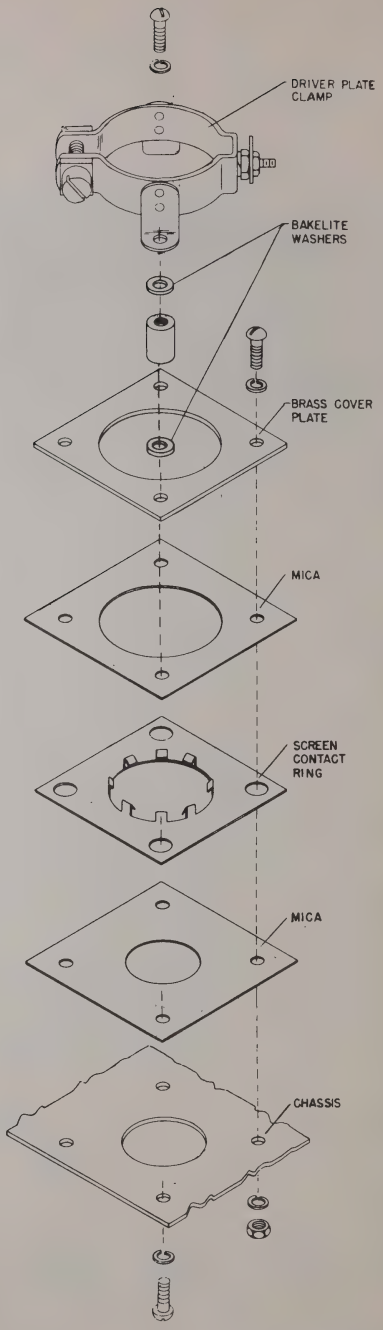


Figure 7–21. Tripler Screen Bypass Capacitor, Exploded View

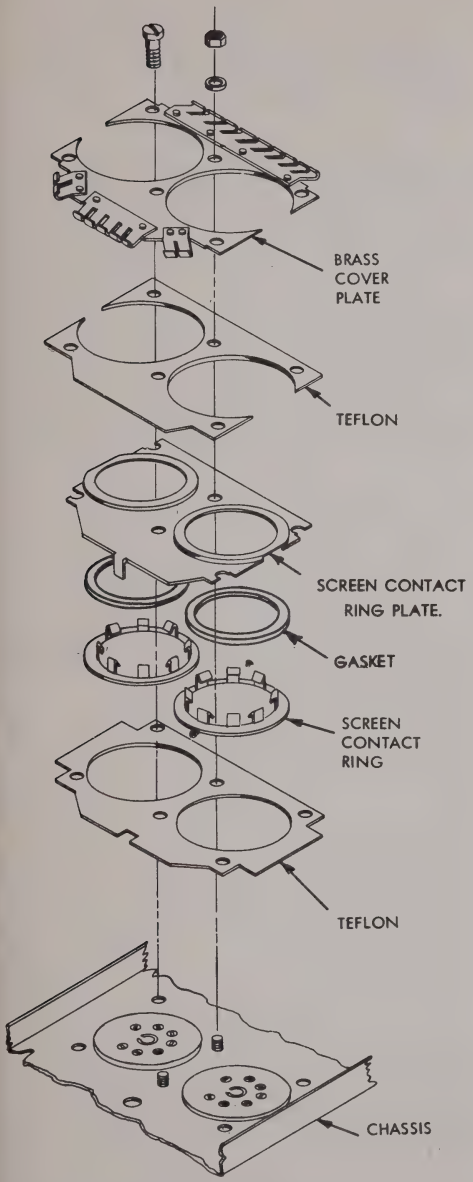


Figure 20A. Power Amplifier Screen Bypass Capacitor, Exploded View for AM-638B/URT

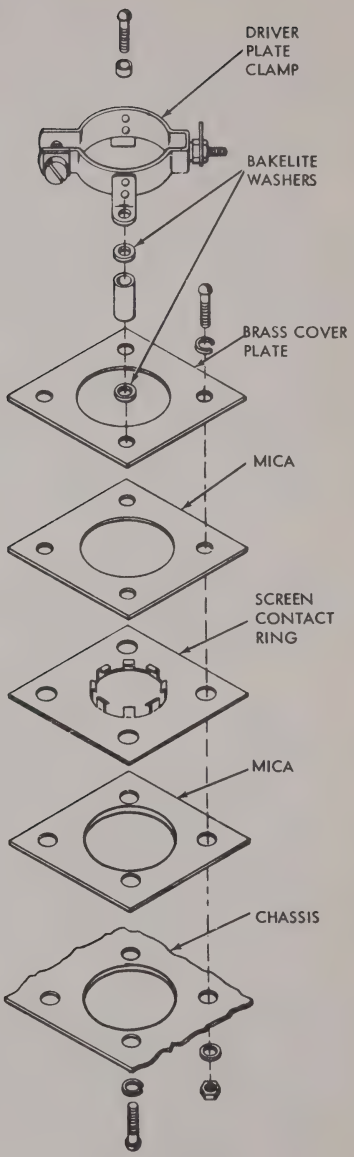


Figure 21A. Tripler Screen Bypass Capacitor, Exploded View for AM-638B/URT

4. R-F ALIGNMENT.

a. CHECKING ALIGNMENT.

Note

The Radio Transmitter *must* be completely assembled during alignment or a check thereof. Do *not* use the test cables for interconnections.

(1) After being certain that the CRYSTAL SELECTOR is resting in one of its four positions, open the access door to the crystal compartment. If the switch is between two normal positions, the access door will not open without being forced. Forcing the door may damage the crystal holders.

(2) Insert the crystal for the low-frequency end of the band, 115 mc (oscillator frequency 19.167 mc), in CRYSTAL SELECTOR switch position 1. Insert the crystal for the high-frequency output, 156 mc (oscillator frequency 26.00 mc), in position 4 of the CRYSTAL SELECTOR. Two middle-frequency crystals may be used in positions 2 and 3 for spot-checking the alignment.

(3) Set the CRYSTAL SELECTOR to position 4, the high-frequency crystal. Tune the equipment, following the instructions in Section 4, paragraph 2.

(4) Check the tracking at the high end by switching the METER switch to DOUBLER I_g, to read doubler grid current. Vary the R.F. DRIVER TUNING control to note the position of the maximum reading. Then set the METER switch to TRIPLER I_g and vary the tuning control. The maximum reading should occur at the same tuning-dial position for both the doubler and tripler grid readings. If it is found that the stages do not track, proceed with the alignment procedure outlined below.

(5) Switch the CRYSTAL SELECTOR to position 1 and tune the low end of the band. Check tracking on the low end in the same manner as in step (4) above.

b. HIGH-FREQUENCY TRACKING.—If it has been established that the r-f stages are not tracking, they should be aligned by using the following procedure:

(1) Switch the CRYSTAL SELECTOR to position 4, the high-frequency crystal.

(2) Push the sliding cover plate for the trimmer capacitors and slug adjustments toward the rear of the Amplifier-Oscillator unit, using the tabs projecting from the hole nearest the front of the chassis. (See figure 7–10.)

(3) Set the R.F. DRIVER TUNING, the P.A. GRID TUNING, and the P.A. TUNING controls all to 458. Turn the METER switch to OUTPUT to read the relative r-f output.

(4) Operate the CARRIER TEST switch and adjust the P.A. TUNING control for maximum output.

(5) Set the METER switch to DOUBLER I_g to read doubler grid current, and operate the CARRIER TEST switch. Tune the oscillator plate trimmer, C604, for maximum doubler grid current.

(6) Set the METER switch to TRIPLER I_g to read the tripler grid current, and operate the CARRIER TEST switch. Tune the doubler plate trimmer, C611, for maximum tripler grid current. Then adjust the amplifier plate trimmer, C616, for a similar indication. Repeat both adjustments as often as necessary to obtain maximum grid current.

(7) Turn the METER switch to PA I_g, measuring the grid current in the power amplifier, and operate the CARRIER TEST switch. Adjust the tripler plate trimmer, C621, for maximum meter indication. Follow this with a similar adjustment of the PA grid trimmer, C638. Repeat these adjustments until the highest possible reading is obtained.

(8) Set the METER switch to OUTPUT and operate the CARRIER TEST switch. Readjust the P.A. TUNING control (D) for maximum r-f output. Then tune the output filter trimmer, C637C, for maximum output. Retune control D and trimmer C637C as often as necessary to obtain the maximum output.

Note

If any tubes in the r-f driver stages are changed, only the adjustments described in the preceding steps need be performed. It is not necessary to track the low-frequency end of the tuning range.

c. LOW-FREQUENCY TRACKING.

(1) Place the CRYSTAL SELECTOR in position 1, the low-frequency crystal. Set the three r-f tuning controls (B, C, and D) each to 195.

(2) Turn the METER switch to OUTPUT and operate the CARRIER TEST switch. Adjust the P.A. TUNING control (D) for maximum r-f output.

(3) Turn the METER switch to DOUBLER I_g and operate the CARRIER TEST switch. Adjust the slug of L602, in the oscillator plate tank, for maximum grid current.

(4) Turn the METER switch to TRIPLER I_g and operate the CARRIER TEST switch. Adjust the slug of L604, in the doubler plate tank, for maximum grid current. Then adjust the slug of L607, in the amplifier plate tank, for a similar indication. Repeat these two adjustments as often as necessary to obtain maximum current in the tripler grid circuit.

(5) Turn the METER switch to PA I_g and operate the CARRIER TEST switch. Adjust the slug of L609, in the tripler plate tank, for maximum PA grid current. If difficulty is encountered in obtaining a maximum, coil L610 should be physically compressed or expanded so that L609 tracks at approximately the middle of its tuning range; see figure 7–24.

(6) Check the alignment of the power-amplifier grid circuit by varying the grid trimmer capacitor, C638. If the grid tank is properly tracking, the reading on the meter should decrease as it is varied each side of its original position. No further adjustment is necessary in the grid for the low end of the band, if this is the case. If a rise in grid current occurs when the trimmer capacity is decreased, the inductance of L614 should be decreased, and vice versa.

If it is found necessary to adjust the grid coil, the right side plate of the unit must be removed. Sixteen Camloc fasteners hold this cover plate in position. Adjustment of the grid coil of the power amplifier must be made by compressing or expanding the turns of the coil as necessary. Each time an adjustment is made, the side plate must be replaced and the tracking checked. Never try to check the alignment of the grid circuit without the side cover plate in place. The absence of the plate will change the entire alignment of the r-f circuits. To increase the inductance of L614, compress the turns. To decrease the inductance of L614, spread the turns farther apart. Very little movement of the coil turns is required to change the settings, so any adjustment made should be very slight. When making any adjustment, care must be taken that the coil is not pushed in or pulled out toward the side plate. The proper position of the coil is approximately three quarters of an inch in from the mounting surface of the side plate. If the coil is pushed in further than this limit, difficulty in tracking the lower frequencies will result. Moving the coil out toward the side plate will cause an increase in the capacitance of the circuit and it will not tune the high end of the range.

(7) Turn the METER switch to OUTPUT, and operate the CARRIER TEST switch. Check the tracking of the plate tank at the low end by tuning it with control D. If a peak cannot be obtained, or the peak occurs too high above the minimum calibration, it will be necessary to adjust the inductance of the plate coil by spreading or compressing the turns.

Turn the equipment off to remove all voltages. Remove the top cover plate to gain access to the plate-tank coil. If a peak meter reading cannot be obtained, increase the inductance of coil L615 by compressing the turns. If the peak occurs too far above the nominal calibration point on the dial, reduce the inductance by spreading the turns apart. Very little movement of the coil turns is required to change the dial setting, so that any adjustment made should be slight. When making adjustments, do not pull the coil out of position; see the precautions in subparagraph (6) above. After adjusting L615, replace the cover and check the calibration; readjust if necessary. Do not

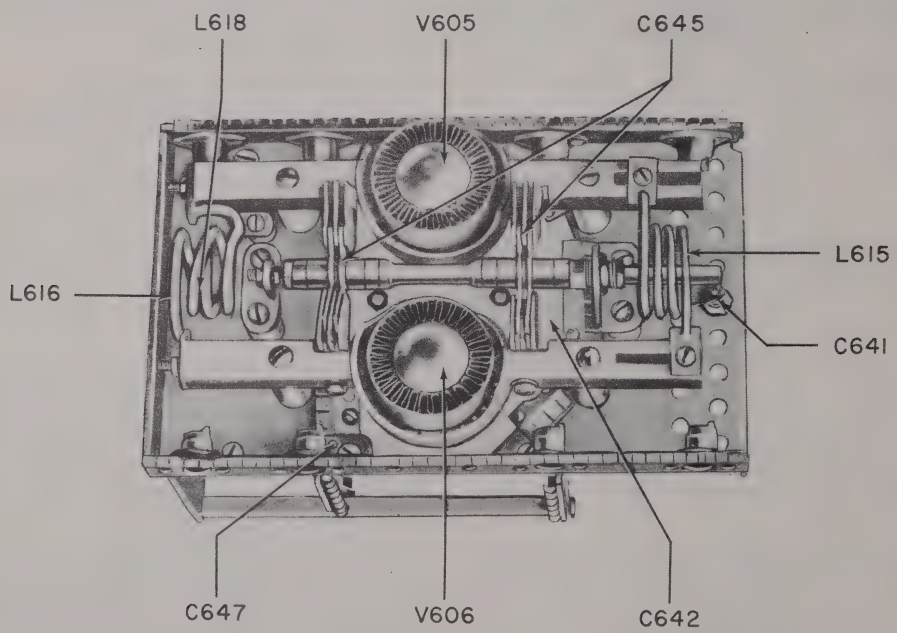


Figure 7—22. Power Amplifier Shelf Assembly, Top View

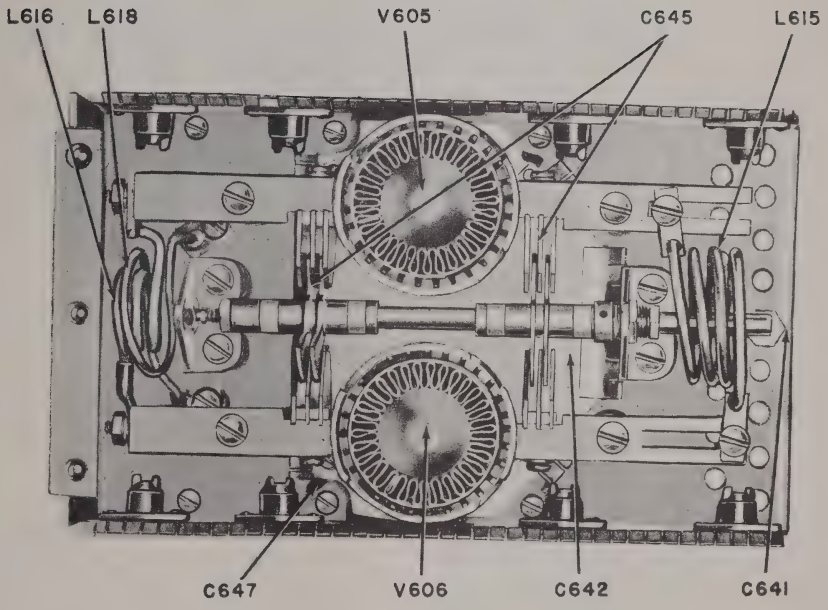


Figure 7—22A. Power Amplifier Shelf Assembly, Top View

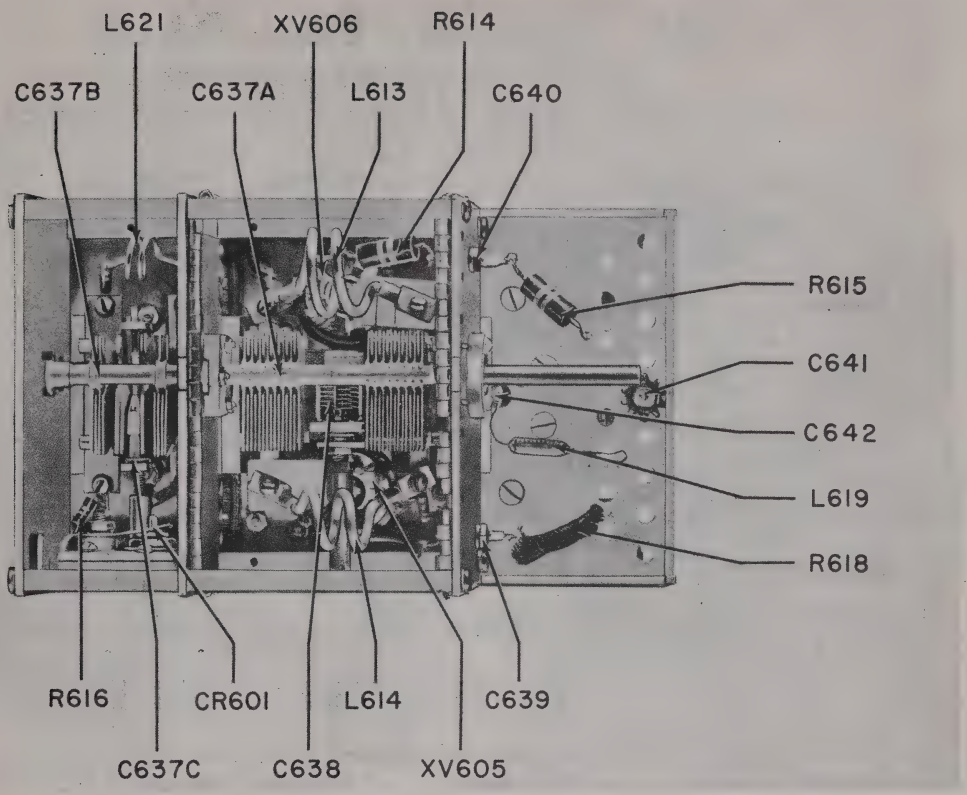


Figure 7—23. Power Amplifier Shelf Assembly, Bottom View

check the calibration without the cover in place, since the entire calibration of the unit will be affected.

(8) Turn the METER switch to PA I_p and operate the CARRIER TEST switch. Check the PA plate current. Repeat this procedure at the high-frequency end of the tuning range. If the output coupling is correctly set, readings between 75 and 87 should result. If readings greater than 87 are obtained, decrease the coupling by increasing the separation between coils L616 and L618 (see figure 7–22). Conversely, if the plate-current readings are low, decrease the spacing between the coils.

(9) After completing the alignment on the low end of the range, it will be necessary to repeat the entire alignment at the high end. Some changes will occur at the high end because of adjustments made at the low end. The readjustments at the high end, if necessary, will necessitate rechecking the low end once again. Repeat this procedure until no change is noted in the meter readings at either end.

d. MID-RANGE TRACKING.—When the alignment of the high and low ends of the band is complete, the tracking at some mid-range frequency should be checked. This may be done by switching the CRYSTAL SELECTOR to position 2 and setting the METER switch to DOUBLER I_g to read the doubler grid current. Adjust the R.F. DRIVER TUNING control to check the position of maximum current indication. Turn the METER switch to TRIPLER I_g and again adjust the R.F. DRIVER TUNING control. The reading should fall off on either side of the original setting of the tuning control. If it does not, the maximum is occuring at a different point from that of the doubler and the unit is not tracking. It can be made to track by adjusting the serrated plates of the tuning capacitors in the driver section.

The right side cover plate of the Amplifier-Oscillator unit must be removed to give access to the capacitor plates. Before adjusting any of the serrated plates of any of the tuning capacitors in the driver

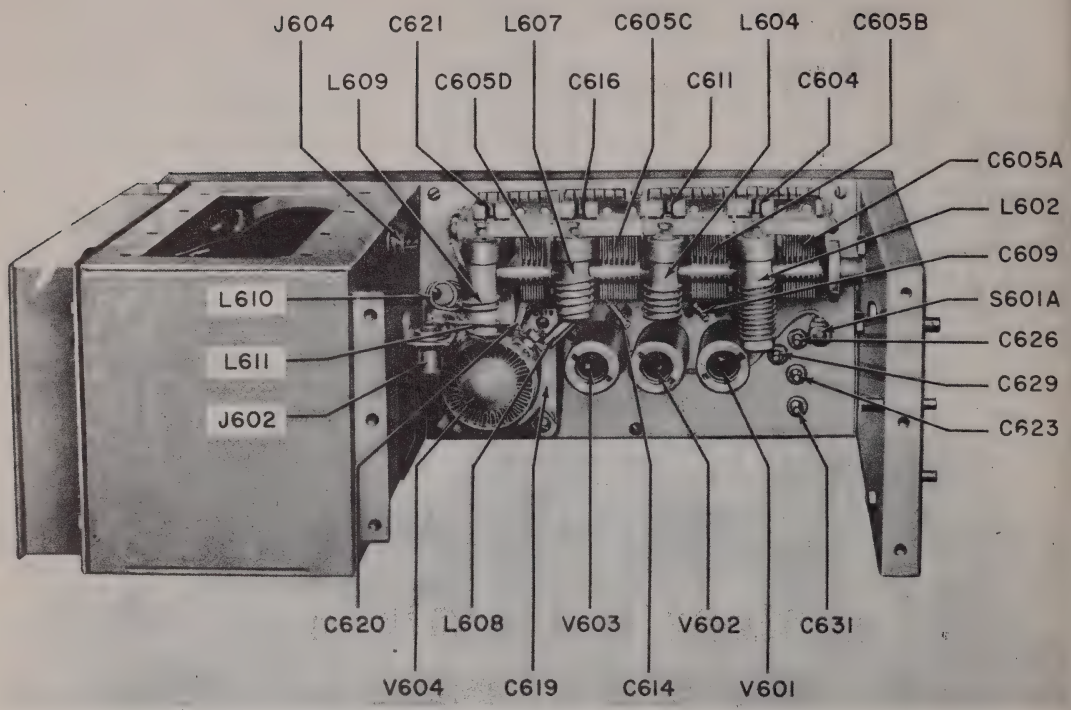


Figure 7—24. Driver Shelf Assembly, Top View

section, vary the trimmer capacitor of the stage in question to see where the peak reading occurs. Should the trimmer capacitor have to be increased to obtain a peak, the serrated plates (the two outside plates of the capacitor) must be bent inward. If the trimmer capacitance has to be decreased to obtain a peak, the capacitance of the tuning capacitor must be decreased by pushing the serrated plates out. Should it be necessary, compensation in one stage may be accomplished by compensation in the opposite direction in other stages. Adjustments made in the first stages of the driver can be checked without replacing the side plate. The additional capacitance when the plate is replaced can be compensated for by adjusting the trimmers. The spacing of the plates of the tuning capacitors is not too critical in regard to arcing in these first stages. Very little rf is present and there is no dc on the capacitor since the stages are shunt fed. Adjustments of the serrated plates of the tripler tuning capacitor, however, must be made with care. There will be a considerable amount of r-f energy present in this tank circuit and it may cause arcing between the plates of the capacitor.

5. ADJUSTMENT OF NONOPERATIONAL RADIO MODULATOR CONTROLS.

a. GENERAL.—Although the operating instructions in Section 4 cover the adjustment of the switches (AVC, VOL EXP, and CLIP-FILT) located internally in the Radio Modulator unit, as well as those controls mounted on the front panel, there are several screwdriver-adjusted controls in that unit which are not normally used by operating personnel. These controls, illustrated in figure 5–1, are preset at the factory prior to shipment and should not be varied unless there is evidence of improper operation of the circuits with which each is associated. It is imperative that the recommended test equipment be available before any changes are made in the control settings; refer to paragraph 2*c*, this section.

b. CLIPPING SYMMETRY CONTROL, R113.—Potentiometer R113 should be readjusted only if major repairs are made in the clipper circuit. If it is necessary to readjust the control, an oscilloscope (AN Type OS-8/U, Navy Model OBL or OBT, or equal) and an audio oscillator with a calibrated output (Navy

Model LAJ, or equal) are required to perform the following steps.

(1) Set the MCW-PHONE switch (S101) to PHONE, turn the SP AMP gain control (R101) to zero, and the MOD level control (R115) to approximately 2. Atop the Radio Modulator chassis, the CLIP-FILT switch (S103) must be ON and the AVC switch (S102) OFF.

(2) Connect the output of the audio oscillator directly across the input winding of input transformer T101. This connection can be made at pins C and D of the HANDSET connector (J403).

(3) Connect the vertical input of the oscilloscope between the wiper arm (center terminal) of R115 and ground.

(4) Advance the SP AMP gain control until a slight amount of clipping, evidenced by flattening of the sine-wave peaks, becomes visible on the oscilloscope.

(5) Loosen the locknut and adjust clipping symmetry potentiometer R113 until the degree of clipping on the positive half-cycles is equal to the degree of clipping on the negative half-cycles. Tighten the locknut on R113.

c. MCW MODULATION LEVEL CONTROL, R141.—The setting of potentiometer R141 can be checked by MCW operation of the Radio Transmitter, as follows:

(1) Turn the MCW-PHONE switch (S101) to MCW and set the METER switch (S401) to MOD; operate the CARRIER TEST switch (S405). The front-panel meter should indicate approximately 58.

(2) If the meter reading is other than 58, loosen the locknut on potentiometer R141 and adjust the control until the proper reading is obtained. Tighten the locknut.

d. MCW OSCILLATOR FREQUENCY CONTROL, C124.—If any of the components in the MCW-oscillator circuit are replaced, especially those which comprise the R-C phase-shifting network, it may be necessary to reset the oscillator frequency to 1,000 cps. To accomplish this adjustment, an oscilloscope (AN Type OS-8/U, Navy Model OBL or OBT, or equal) and an audio oscillator (Navy Model LAJ, or equal) are needed.

(1) Set the oscilloscope sweep control for an external sweep source. Connect the output of the audio oscillator to the horizontal input terminals of the oscilloscope to provide a 1,000-cps sinusoidal sweep.

(2) Connect the vertical input terminals of the oscilloscope between terminal 5 of interstage transformer T102 and ground; see figure 7–15. Exercise care not to short out the bias voltage on the modulator tubes.

(3) Set the MCW-PHONE switch (S101) to MCW and operate the CARRIER TEST switch (S405).

(4) Adjust frequency-control capacitor C124 until an elliptical or straight-line pattern is observed on the oscilloscope, indicating that the MCW-oscillator frequency is equal to the 1,000-cps frequency of the audio oscillator.

e. MCW TIME-DELAY CONTROL, R131. — In MCW operation, the carrier should remain on for 1.0 ± 0.2 seconds after the key is opened. This time delay is introduced so that there is no break in transmission between the keyed characters and words. The hold time can be checked by using a watch with a sweep second hand (or a stop watch, if available) in conjunction with the front-panel meter, as follows:

(1) Set the MCW-PHONE switch (S101) to MCW and the METER switch (S401) to OUTPUT.

(2) Hold the watch next to the front-panel meter so that both are in the field of vision. Operate the CARRIER TEST switch (S405).

(3) Check the reading of the second hand of the watch and simultaneously release the CARRIER TEST switch. Note the interval between the time the CARRIER TEST switch was released and the time that the meter pointer *starts* to drop.

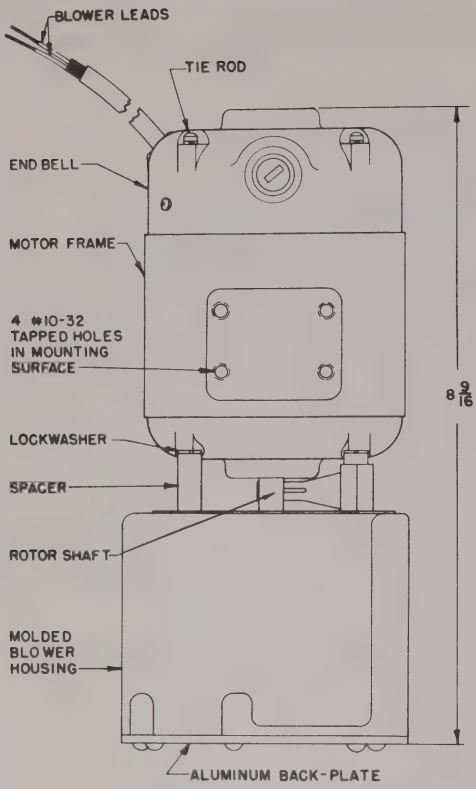
Note

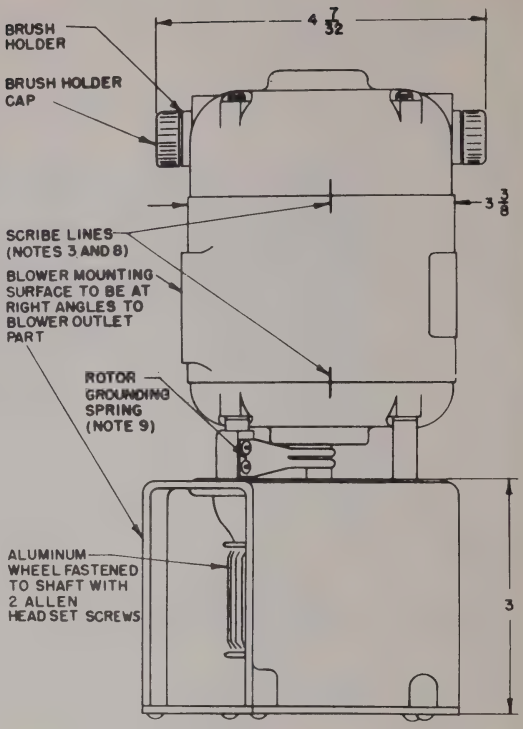
An alternate indication for the drop in meter reading is to check, either by watching or listening, the time of release of relay K401 or K403 (see figure 7–6).

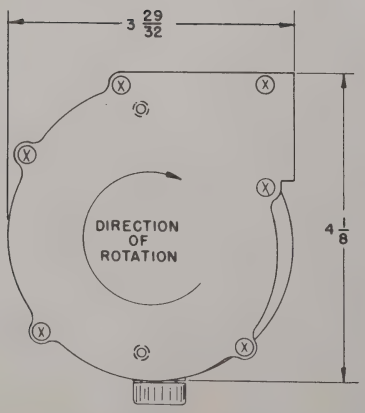
(4) If the timed interval is less than 0.8 second, loosen the locknut and adjust potentiometer R131 counterclockwise until the proper delay is obtained, repeating steps (2) and (3) as necessary. If the interval is greater than 1.2 seconds, adjust R131 in a clockwise direction. Then tighten the locknut.

6. BLOWER MOTOR.

a. IDENTIFICATION OF BLOWER MODEL AND REPLACEMENT PARTS.—The Radio Transmitter is supplied with one of two alternative type blowers, either a Rotron Model D Type US-2503 or a Howard Model 715-1. Identification as to model may be made from the blower nameplate, which is visible when the cover plate is removed from the right side of the Amplifier-Oscillator blower compartment; see figure 7–10. The two types of blowers are completely interchangeable; however, the brushes and bearings are different. For that reason, each maintenance parts kit accompanying the equipment contains replacement brushes and bearings for both blower models. The brushes and bearings for the Rotron blower are designated E612 and O602, respectively, while those for the Howard unit are designated E615 and O608. Be certain that the parts selected for replacement are those which are intended for the blower supplied in the equipment.




BRUSH HOLDER
BRUSH HOLDER CAP
4 7/32
3 3/8
SCRIBE LINES (NOTES 3 AND 8)
BLOWER MOUNTING SURFACE TO BE AT RIGHT ANGLES TO BLOWER OUTLET PART
ROTOR GROUNDING SPRING (NOTE 9)
ALUMINUM WHEEL FASTENED TO SHAFT WITH 2 ALLEN HEAD SET SCREWS
3



NOTES

DISASSEMBLY

1. REMOVE ALUMINUM BACK-PLATE.
2. REMOVE ALUMINUM WHEEL BY LOOSENING ALLEN HEAD SET SCREWS.
3. SCRIBE LINES ON ENDBELLS AND MOTOR FRAME TO SHOW PROPER ALIGNMENT.
4. REMOVE MOLDED BLOWER HOUSING, SPACERS AND LOCKWASHERS BY UNSCREWING 4 TIE RODS.
5. REMOVE BRUSHES.
6. CAREFULLY REMOVE ENDBELLS, NOTING SEATING OF BEARINGS ON SPRING LOADING WASHERS.
7. CLEAN BLOWER AND REPLACE DEFECTIVE PARTS.

ASSEMBLY

8. CAREFULLY REPLACE SPRING LOADING WASHERS, BEARINGS AND ENDBELLS USING SCRIBBED LINES FOR ENDBELL ALIGNMENT.
9. ASSEMBLE TIE BOLTS, LOCKWASHERS, SPACERS AND MOLDED BLOWER HOUSING. ROTATE SPACER WITH ROTOR GROUNDING SPRING TO GIVE SLIGHT SPRING PRESSURE. TIGHTEN THE BOLTS IN ROTATION TO PREVENT MISALIGNMENT.
10. CAREFULLY REPLACE BRUSHES.
11. REPLACE ALUMINUM WHEEL WITH OPEN END TOWARD MOTOR. TIGHTEN SET SCREWS ON FLATS ON ROTOR SHAFT.
12. REPLACE ALUMINUM BACK-PLATE.

Figure 7–25. Blower, Rotron Model D Type US-2503, Outline Drawing

The maintenance procedures described in the succeeding subparagraphs are applicable to either type of blower unless otherwise indicated. Where so instructed, refer to the appropriate outline drawing for the blower undergoing service. Figure 7–25 shows the Rotron model, while the Howard blower is illustrated in figure 7–26. In model AM-638A/URT, American Blower Part No. K17200 is used. The following information on the Howard Blower also pertains to the American Blower, except where otherwise stated. The brushes and bearings for the American Blower are designated E615-1** to E615-2** and O608-1** to O608-2** respectively.

b. INSPECTION OR REPLACEMENT OF MOTOR BRUSHES. *(See figure 7–25 or 7–26.)*

(1) Remove the right and left side cover plates from the blower compartment at the rear of the Amplifier-Oscillator unit.

(2) Remove the brush-holder caps.

(3) Remove the brush assembly consisting of cap, spring, shunt, and carbon.

(4) If the brushes are less than 1/4 inch long, proceed as follows:

(*a*) For the Rotron blower, clean as detailed in paragraph 6*d*(1), steps (*a*) through (*g*), (*j*), and (*k*). Replace the brushes, using E612 from the maintenance parts kit.

(*b*) For the Howard blower, clean as detailed in paragraph 6*d*(2), steps (*a*) through (*g*) and (*k*) through (*m*). Replace the brushes, using E615 from the maintenance parts kit. A maintenance part kit is not supplied for the American Blower.

(5) Insert the brush assembly. Due care should be taken that the beryllium-copper coil spring is loaded into the brush holder evenly and not distorted in the operation. If the old brushes are reinstalled, be certain to restore each brush to the holder from which it was removed, with the same orientation with respect to the direction of motor rotation.

c. REMOVAL FOR SERVICING.—When removing the blower unit for periodic servicing, cleaning, repair, or replacement, perform the removal in accordance with the the following steps. (See figures 7–10 through 7–12.)

(1) Remove the bottom cover plate of the Amplifier-Oscillator. This plate is held in place by 16 screws.

(2) Loosen the four slide fasteners holding the air filter and remove the filter.

(3) Unsolder the leads to noise filter E601, which are exposed after removing the bottom plate. Do not remove the filter from the motor housing.

(4) Remove the left side cover plate of the blower compartment.

(5) Remove the right side cover plate.

(6) Disconnect the antenna coaxial lead from J604. This connector is located in the blower compartment and will interfere with the removal of the motor.

(7) Take out the four screws from the mounting plate on the left side.

(8) Lift the blower out through the bottom of the chassis.

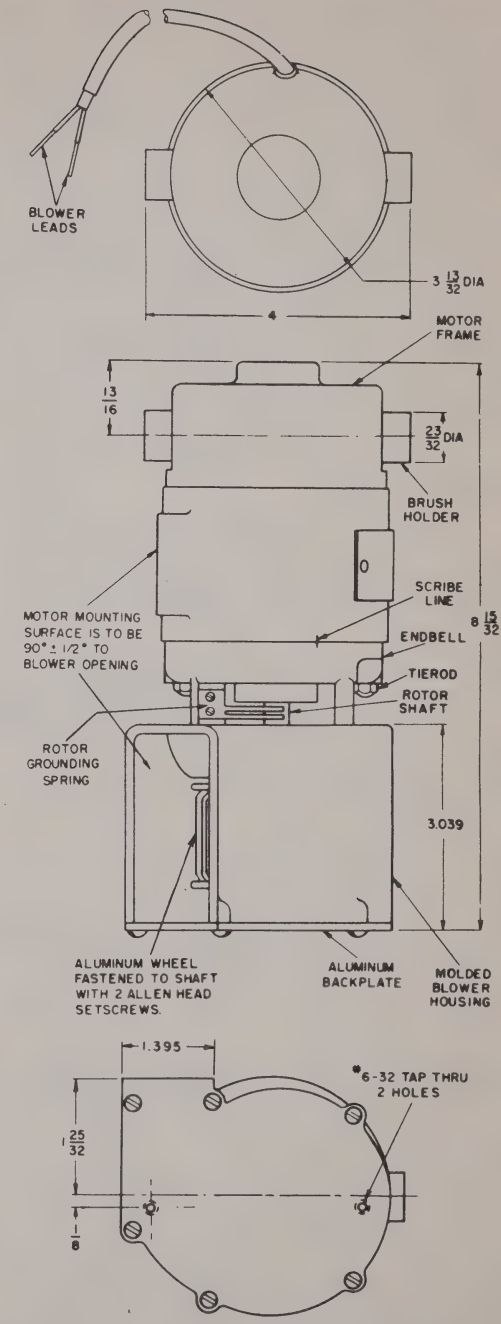


Figure 7–26. Blower, Howard Model 715-1, Outline Drawing

d. REPLACEMENT OF MOTOR BEARINGS.

(1) ROTRON MODEL D TYPE US-2503. *(See figure 7–25.)*

(a) Remove the blower-motor assembly from the Amplifier-Oscillator unit, as described in paragraph 6*c*.

(b) Remove the aluminum backplate from the molded blower housing.

(c) Remove the aluminum wheel from the motor shaft by inserting an Allen wrench through the opening of the blower outlet port and loosening the two setscrews.

(d) Scribe lines on the endbells and motor frame to show proper alignment.

(e) Remove the four tie rods. Their ends are at the end of the motor holding the brush holders. This step loosens the motor from the blower housing. Due care must be taken that the spacers and lockwashers between motor and blower housing are retained.

(f) Remove brushes from the brush holders as described in paragraph 6*b*. Remove the two endbells from the motor frame.

(g) Blow out carbon dust from all motor parts.

(h) Remove the two ball bearings with a bearing puller. Due care should be taken that the long shaft extension is not misaligned by excess pressure during this operation.

(i) Fit two new ball bearings (O602) on the shaft, using an arbor press or suitable bearing installer tool. Locate them in the same positions as those just removed.

(j) Replace endbells on the frame. Due care is to be taken that the spring-loading washer located at the bottom of the bearing cup remote from the shaft extension is placed in position.

(k) Replace all other parts in reverse sequence from the preceding disassembly procedure.

(2) HOWARD MODEL 715-1 and American Blower Part No. K17200. *(See figure 7–26.)*

(a) Remove the blower-motor assembly from the Amplifier-Oscillator unit, as described in paragraph 6*c*.

(b) Remove the aluminum backplate from the molded blower housing.

(c) Remove the aluminum wheel from the motor shaft by inserting an Allen wrench through the opening of the blower outlet port and loosening the two setscrews.

(d) Scribe a line on the endbell and motor frame to show proper alignment.

(e) Remove brushes from the brush holders as described in paragraph 6*b*.

(f) Remove the nuts and lockwashers, located between the motor frame and the blower housing, from the two tie rods which secure the endbell to the frame. Remove the endbell and molded blower housing, as one assembly, from the frame. On American Blower Part No. K17200, remove the 4 screws and lockwashers which secure the blower housing plate to the motor housing by inserting a long screwdriver thru the blower housing. Remove the blower housing. To remove the endbell, remove the 2 countersunk screws.

(g) Withdraw the motor armature from the frame, being careful not to lose the washers used at the ends of the armature shaft. Blow out carbon dust from all motor parts.

(h) Remove the two ball bearings with a bearing puller. Do not misalign the armature shaft by exerting pressure during this operation.

(i) Fit two new ball bearings (O608) on the shaft, using an arbor press or suitable bearing installer tool. Locate them in the same positions as those just removed.

(k) Replace the armature in the motor frame; be certain to replace the flat washer between the closed end of the frame and the bearing.

(l) Replace the spring-loading washer on the shaft so that the flat surface of the washer will fit flush against the inner surface of the endbell. Replace the endbell and molded blower housing on the motor frame, making sure the scribed lines are aligned.

(m) Replace all other parts in reverse sequence from the preceding disassembly procedure.

e. REPLACEMENT IN AMPLIFIER-OSCILLATOR. —When replacing the blower, the procedure described in paragraph 6*c* is reversed. Line up the blower port with the air vent in the blower compartment before fastening the motor in place. Tighten the four mounting screws slowly and in rotation. If they are completely tightened one at a time, the vanes of the blower may be thrown out of alignment and the side of the housing will interfere with their free rotation, causing overheating of the motor.

7. COMPONENT DATA.

a. ELECTRON TUBES.—The rated characteristics of all electron tubes used in the equipment appear in table 7–4. Indications of faulty operation which may be rectified by replacement of one or more tubes are listed in table 5–3 and are treated in the trouble-shooting portions of paragraph 2, this section.

Note

ALL TUBES OF A GIVEN TYPE SUPPLIED WITH THE EQUIPMENT SHALL BE CONSUMED PRIOR TO EMPLOYMENT OF TUBES FROM GENERAL STOCK.

b. CRYSTALS.—All pertinent data for Crystal Unit CR-24/U, used as the frequency-controlling component in this equipment, appear in figure 7–27.

c. TRANSFORMERS AND INDUCTORS. — The inductance, d-c resistance, turns ratio, wire size and number of turns, and other miscellaneous information (as applicable) for all transformers, chokes, and coils used in this equipment are listed in table 7–5.

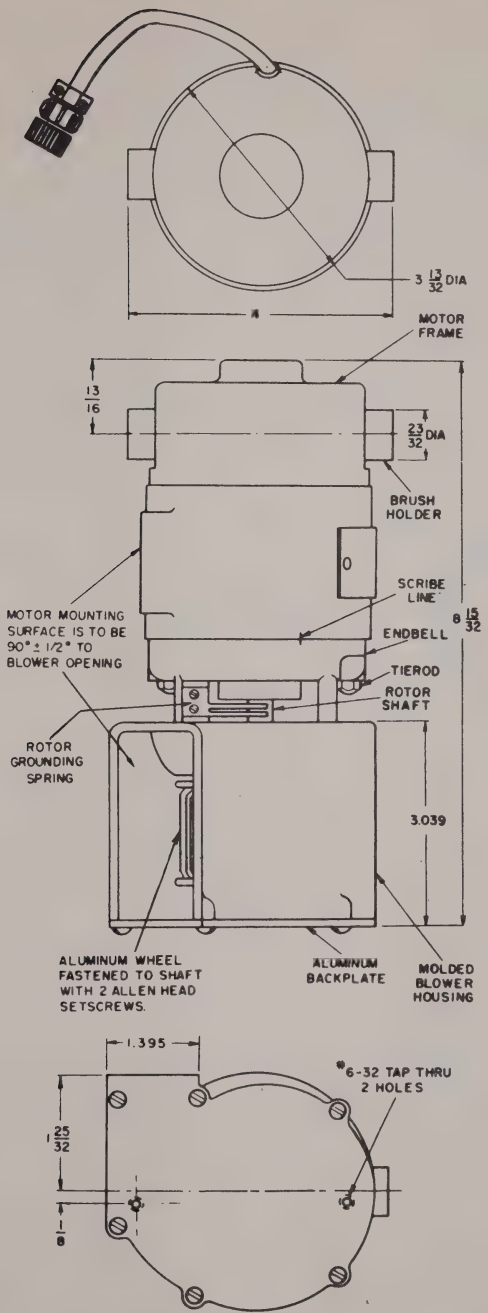
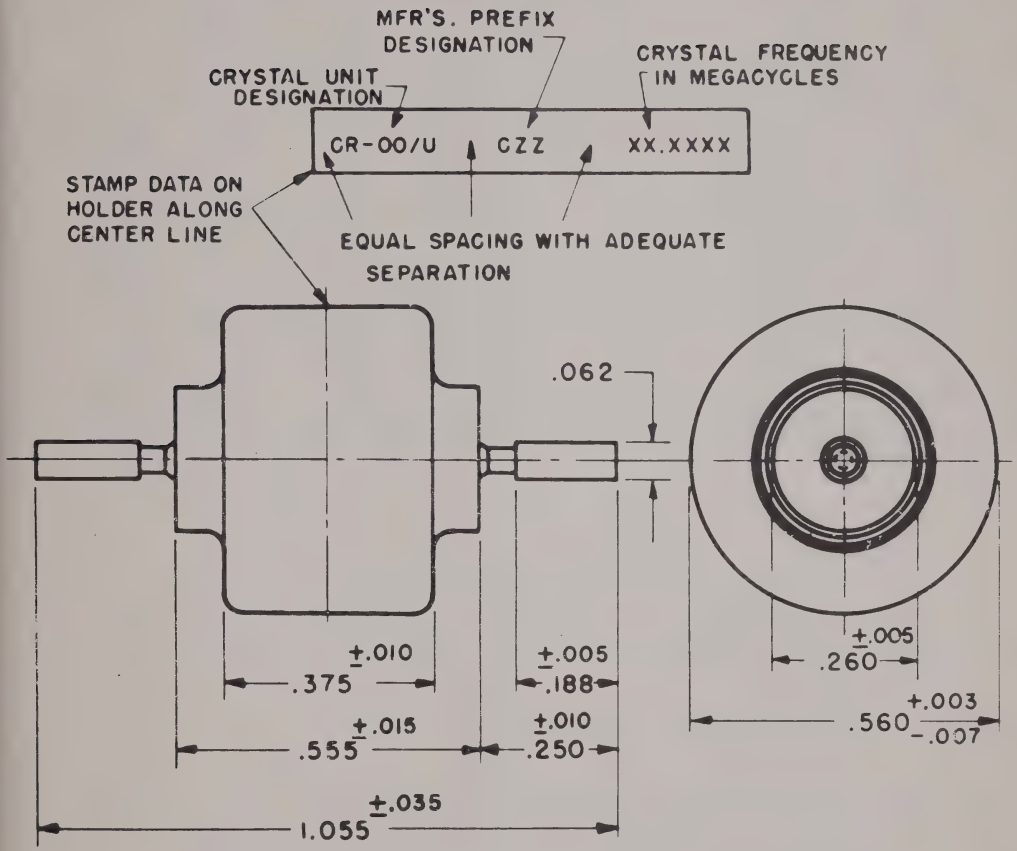


Figure 7-26A. Blower, American Blower Part No. K17200, Outline Drawing for AM-638B/URT



1. FREQUENCY RANGE OF CRYSTALS USED = 19.1667 TO 26.0000 MC.
2. METHOD OF MULTIPLICATION = CRYSTAL FREQUENCY X 2 X 3.
3. TEMP. CHARACTERISTIC = ± 0.005 % DEVIATION BETWEEN − 55° C (−67° F) AND + 90° C (+ 194° F).
4. TEMPERATURE OF OPERATION AND CALIBRATION = − 55° C (− 67° F) TO + 90° C (+ 194° F).
5. MODE OF OPERATION = 5 TH MODE FOR 25 − 50 MC., 3RD MODE FOR 15-25 MC.

Figure 7−27. Crystal Unit CR-24/U, Outline and Data

TABLE 7–4. TUBE CHARACTERISTICS

TUBE TYPE	FILAMENT VOLTAGE (V)	FILAMENT CURRENT (A)	PLATE VOLTAGE (V)	GRID BIAS (V)	SCREEN VOLTAGE (V)	PLATE CURRENT (MA)	SCREEN CURRENT (MA)	A-C PLATE RESISTANCE (OHMS)	VOLTAGE AMPLIFICATION FACTOR (MU)	NORMAL TRANSCONDUCT. (MICROMHOS)
3B28	2.5	5.0	10,000*	—	—	250	—	8V drop	—	—
4X150A	6.0	2.6	600	–75	250	200	37	—	—	12,000 approx.
6AL5	6.3	0.3	460*	—	—	—	—	—	—	—
6AT6	6.3	0.3	250	–3	—	1.0	—	58,000	70	1200
6BA6	6.3	0.3	250	–20	100	11	4.2	1.5 meg.	—	4400
12AT7	6.3	0.3	250	–2	—	10.0	—	10,000	55	5500
12AU7	6.3	0.3	250	–8.5	—	10.5	—	7700	17	2200
807	6.3	0.9	600	–30	300	200	10.0	—	—	6000 approx.

*Peak inverse voltage.

TABLE 7–5. WINDING DATA

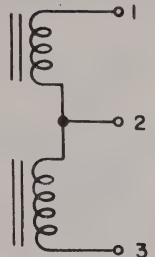
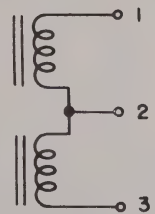
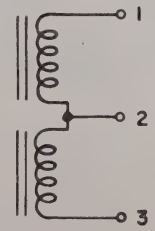
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
L401	FTRC A1002817		1-2	#24E	1224	32.4	—	2500	Inductance: 3 hys min at 0.5 A DC and 240 v RMS 120 cps across winding.
			2-3	#26E	1300	47.5	—	2500	Inductance: 3 hys min at 0.37 A DC and 25 v 120 cps across winding. Vacuum varnish cores and coils.
L402	FTRC A1002818		1-2	#21E	270	1.51	—	1500	Inductance measured across (1-2) or (2-3): 0.080 hys min at 660 ma dc with 0.3 v RMS (2-3) and 7 v RMS (1-2), 120 cps, across winding. Vacuum varnish cores and coils.
			2-3	#21E	270	1.51	—	1500	
L403	FTRC A1002819		1-2	#30E	850	25.0	—	1500	1. Across winding 2-3: Min inductance = .05 hy at 0.13 A DC and 0.3 v RMS 120 cps. 2. Across winding 1-2: Same as above except 35 v RMS. 3. Vacuum varnish cores and coils.
			2-3	#30E	850	25.0			

TABLE 7–5. WINDING DATA (Cont)

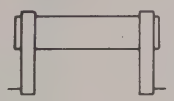
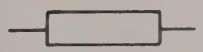
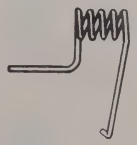
DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESIST-ANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
L601	Ohmite Z-28		Single-layer solenoid	#34	115	2.4	—	—	Inductance: 21 micro-henries; resonance frequency: 46 mc; current rating: 500 ma.
L602	FTRC A1001009-8		Single-layer solenoid	0.064" D. Silver plated	11	—	—	—	
L603 L605 L606	Ohmite Z-50		Single-layer solenoid	#33	57	0.894	—	—	Inductance: 7.0 micro-henries; resonance frequency: 80 mc; current rating: 1000 ma.
L604	FTRC A1001009-7		Single-layer solenoid	0.064" D. Silver plated	5	—	—	—	
L608 L617	Ohmite Z-144		Single-layer solenoid	#32	35	0.294	—	—	Inductance: 1.8 micro-henries; resonance frequency: 180 mc; current rating: 1000 ma.
L609	FTRC A1001009-6		Single-layer solenoid	0.064" D. Silver plated	2	—	—	—	

TABLE 7–5. WINDING DATA (Cont)

DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESIST-ANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
L610	FTRC A1001027-2		Single-layer solenoid	0.064" D. Silver plated	1½	—	—	—	
L611	FTRC A1001742		Single-layer solenoid	0.064" D. Silver plated	2	—	—	—	
L612	FTRC A1001193		Single-turn loop	0.064" D. Silver plated	1	—	—	—	
L613	FTRC A1000834-2		Single-layer solenoid	#8 Silver plated	2	—	—	—	
L614	FTRC A1000836-2		Single-layer solenoid	#8 Silver plated	2	—	—	—	
L615	FTRC A1002180-2		Single-layer solenoid	#8 Silver plated	3	—	—	—	

TABLE 7–5. WINDING DATA (Cont)

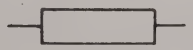
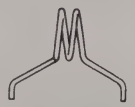
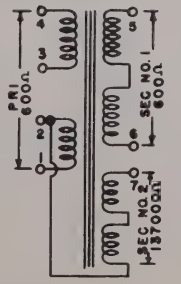
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
L616	FTRC A1002180-3		Single-layer solenoid	#8 Silver plated	2½	—	—	—	
L618	FTRC A1002180-1		Single-turn loop	#8 Silver plated	1	—	—	—	
L619 L620	Ohmite Z-235		Single-layer solenoid	—	—	0.049	—	—	Inductance: 0.84 microhenries; resonance frequency: 300 mc; current rating: 100 ma.
L621	FTRC A1010542		Single-layer solenoid	0.064" D. Silver plated	2	—	—	—	
T101	FTRC A1002342		Primary #1 Primary #2 Sec. #1 Sec. #2	#33E #33E #33E #41E	180 180 322 6120	13 13 38 4300	150 ohms 150 ohms 600 ohms 1:1 (pri 1+2) 855,000 ohms: 1:1425 (pri 1+2)	500 500 500 500	Impedance: 180 ohms min at 0.6 v, 60 cps and 50 ma dc. Core type const. wax impregnation

TABLE 7–5. WINDING DATA (Cont)

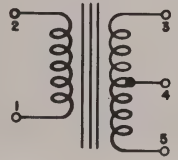
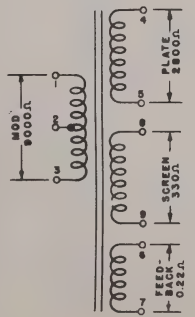
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
T102	FTRC A1003501		Primary (1-2)	#36E	1370	170	7700 ohms	1500	1. Min inductance: 2.6 hys at 11 ma dc and 10.8 v, 300 cps across winding (1-2).
			Secondary (3-4-5)	#41E	5750 C.T.	1770	136,000 ohms C.T., 17.7:1	1500	2. Midtap within 1 percent of neutral. 3. Vacuum wax core and coil. 4. #24 wire each winding.
T103	FTRC A1002343		Modulator	#34	1632 C.T.	213	9000 ohms plate to-plate-	2500	Balanced C.T.
			Plate	#31	932 C.T.	61	2800 ohms 3.2:1	2500	#24 wire leads each winding.
			Screen	#34	321.5	66	330 ohms 28.2:1	2500	Tightly coupled to plate.
			Feedback	#34	8.5	1.9	0.22 ohms 40,900:1	1000	Polarity additive.

TABLE 7–5. WINDING DATA (Cont)

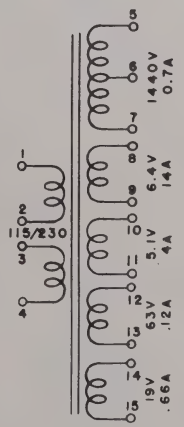
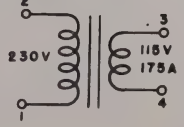
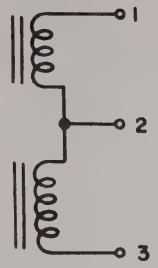
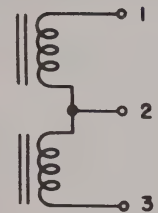
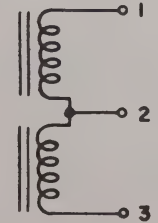
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
T401	FTRC A1002844		Primary (1-2)	#18E	128	0.72	—	2000	No Load Voltage ±3% / Full Load Voltage
			Primary (3-4)	#18E	128	0.72	—	2000	115 or 230
			Plate (5-6-7)	#25E	1700 tap @ 850	56.0	—	2000	1530/765 / 1440/720
			Fila. #1 (8-9)	3 #15E	7½ (3 wide)	0.0096	—	2000	6.74 / 6.40
			Fila. #2 (10-11)	#16E	6	0.0133	—	2000	5.40 / 5.10
			Sel. Rect. #1 (12-13)	#32E	74	13.4	—	2000	66.5 / 63.0
			Sel. Rect. #2 (14-15)	#25E	22	0.81	—	2000	19.8 / 19.0
									1. Vac. varnish core and coils. 2. All coils additive polarity. 3. Midtap within 1 percent of neut.
T402	FTRC A1002937		Primary (1-2)	#33E	1400	117	—	1500	No Load Voltage ±3% / Full Load Voltage 230
			Secondary (3-4)	#30E	800	53.0	—	1500	131 / 115
									Vacuum varnish core and coils.

TABLE 7—5A. WINDING DATA (PECULIAR TO T-336A/URT-7)

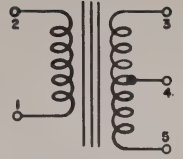
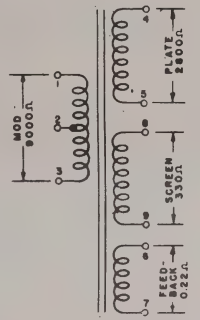
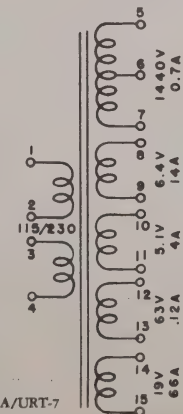
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
L401**	LC-0213		1-2	#24E	1121	20.5	—	3100	
			2-3	#26E	1300	36	—	3100	
L402**	LC-0214		1-2	#21E	216	1.2	—	5000	
			2-3	#21E	216	1.2	—	5000	
L403**	LC-0215		1-2	#30E	650	18.3	—	500	
			2-3	#30E	650	18.3	—	500	

**Used on Radio Transmitter T-336A/URT-7

TABLE 7–5A. WINDING DATA (PECULIAR TO T-336A/URT-7) (Cont)

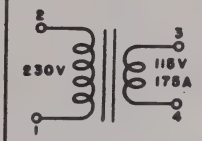
DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESIST-ANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
L615**	LW-0091		Single layer sole-noid	#8 Silver plated	2-1/2	—	—	—	
L616**	LW-0093		Single layer sole-noid	#8 Silver plated	3	—	—	—	
L618**	LW-0089		Single layer sole-noid	#11 Silver plated	3/4	—	—	—	
T101**	LA-0053		Primary #1	#30E	191	6.3	—	1250	
			Primary #2	#30E	191	7.5	—	1250	
			Sec. #1	#31E	270	12.1	—	1250	
			Sec. #2	#44E	10,380	7250	—	1250	

TABLE 7–5A. WINDING DATA (PECULIAR TO T-336A/URT-7) (Cont)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
T102**	LM-0058		Primary (1-2)	#42E	2450	930	—	1500	
			Secondary (3-4-5)	#43E	11200 C.T.	7080	—	1500	
T103**	LH-0001		Modulator	#33E	1930 C.T.	162	—	3000	
			Plate	#29	773 C.T.	30.5	—	3000	
			Screen	#35E	283	51	—	2500	
			Feedback	#35E	7	1.4	—	1500	
T401**	LP-0234		Primary (1-2)	#17E	86	0.47	—	2500	
			Primary (3-4)	#17E	96	0.51	—	2500	
			Plate (5-6-7)	#24E	1148 tap at 574	36.5	—	2500	
			Fila. #1 (8-9)	#9E	5	0.0095	—	2500	

**Used on Radio Transmitter T-336A/URT-7

TABLE 7–5A. WINDING DATA (PECULIAR TO T-336A/URT-7) (Cont)

DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESIST-ANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
T401** (Contd)			Sel. Rect. #1 (12-13)	#30E	49	7.5	—	2500	
			Sel. Rect. #2 (14-15)	#24E	15	0.57	—	2500	
T402**	LP-0235		Primary (1-2)	#33E	1400	117	—	1500	
			Secondary (3-4)	#30E	800	53.0	—	1500	

**Used on Radio Transmitter T-336A/URT-7

IN MICROFARADS EXCEPT WHERE OTHERWISE NOTED. RESISTOR VALUES IN OHMS
HERWISE NOTED. K=1000 OHMS.

HES SHOWN IN NORMAL OPERATING POSITION.

WN UNENERGIZED.

RM OF POTENTIOMETER SHOWS DIRECTION OF CLOCKWISE ROTATION FACING SHAFT END

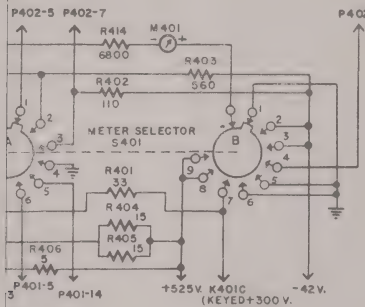
DRAWN FOR 115V. AC OPERATION, FOR 230V. OPERATION SEE FIG. 7-31

F COILS AND TRANSFORMER WINDINGS IS LESS THAN ONE OHM UNLESS OTHERWISE
WITH ARROW REFERS TO TOTAL DC RESISTANCE OF THE WHOLE WINDING IN OHMS.

RE TERMINALS		GROUNDED TERMINALS	
22	P403, J501	5, 15, 16	P401, J101 6, 7
	E502	15, 16, 19, 20	P402, J601 15

IRCUIT (M401, R414, S401A, B) ENCLOSED IN DOTTED LINES IS SHOWN FUNCTIONALLY.
H S401 TRANSFERS INDICATION TO THE FOLLOWING CIRCUITS:

INDICATION	POSITION	INDICATION
DOUBLER Ig	6	MOD.
TRIPLER Ig	7	VOL. EXP.
PA Ig	8	TRIPLER Ip
OUTPUT AVC	9	PA Ip



ION

KEYING RELAY

K402 START-STOP RELAY

CONTROL OF CARRIER CONTROL (V110)

A — PRIMARY POWER CONTROL OF TRANSFORMER T401

OSCILLATOR KEYING

B

C — STANDARD REMOTE UNIT POWER INDICATOR CONTROL

CARRIER CONTROL RELAY

D — HOLDING VOLTAGE FOR COIL K402

OCIATED RECEIVER AUDIO CONTROL

ER INDICATOR (I402) CONTROL

K403 ANTENNA TRANSFER RELAY

R. GRID GROUND CONTROL

300 V. SUPPLY VOLTAGE (SEE FIG. 2-11)

. SUPPLY REGULATION (SEE FIG 2-11)

DARD REMOTE UNIT

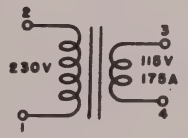
RIER INDICATOR CONTROL

V. SUPPLY REGULATION (SEE FIG. 2-11)

er T-336A/URT-7, Schematic Diagram

7-38A
7-38B

TABLE 7–5A. WINDING DATA (PECULIAR TO T-336A/URT-7) (Cont)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D. C. RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT AC VOLTS	REMARKS
T401** (Contd)			Sel. Rect. #1 (12-13)	#30E	49	7.5	—	2500	
			Sel. Rect. #2 (14-15)	#24E	15	0.57	—	2500	
T402**	LP-0235		Primary (1-2)	#33E	1400	117	—	1500	
			Secondary (3-4)	#30E	800	53.0	—	1500	

**Used on Radio Transmitter T-336A/URT-7

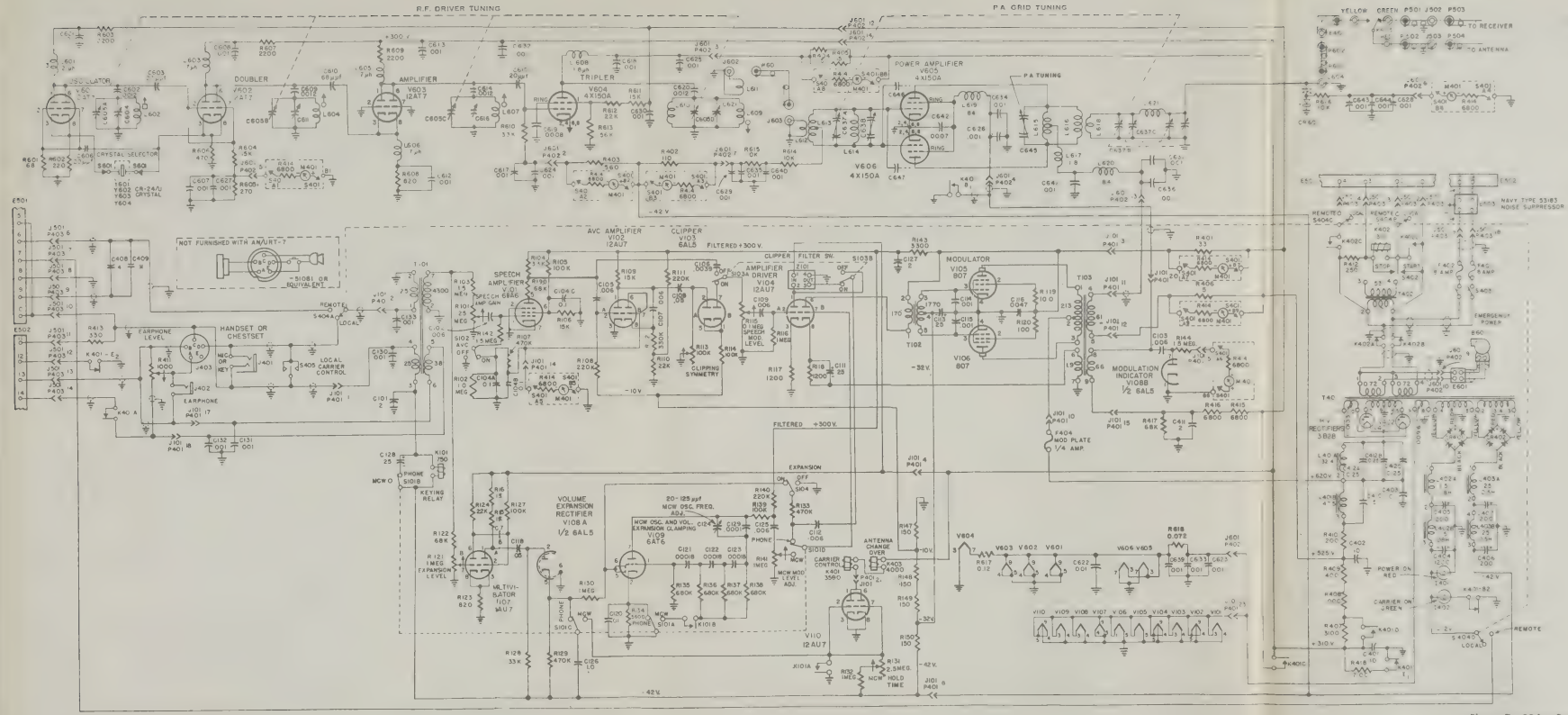


Figure 7—28A. Radio Transmitter T-336A/URT-7, Schematic Diagram

7—38A
7—38B

CHANGE 1

N MICROFARADS EXCEPT WHERE OTHERWISE NOTED. RESISTOR VALUES IN OHMS
ERWISE NOTED. K=1000 OHMS.

ES SHOWN IN NORMAL OPERATING POSITION.

N UNENERGIZED.

M OF POTENTIOMETER SHOWS DIRECTION OF CLOCKWISE ROTATION FACING SHAFT END

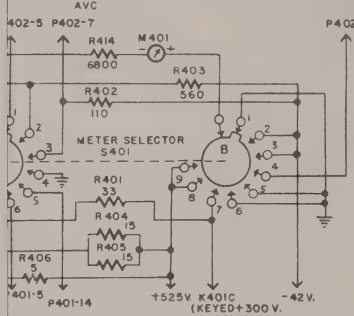
RAWN FOR 115V. AC OPERATION, FOR 230V. OPERATION SEE FIG. 7-31

COILS AND TRANSFORMER WINDINGS IS LESS THAN ONE OHM UNLESS OTHERWISE
TH ARROW REFERS TO TOTAL DC RESISTANCE OF THE WHOLE WINDING IN OHMS.

E TERMINALS		GROUNDED TERMINALS	
2	P403, J501: 5, 15, 16	P401, J101: 6, 7	
	E502: 15, 16, 19, 20	P402, J601: 15	

RCUIT (M401, R414, S401A, B) ENCLOSED IN DOTTED LINES IS SHOWN FUNCTIONALLY.
S401 TRANSFERS INDICATION TO THE FOLLOWING CIRCUITS:

INDICATION	POSITION	INDICATION
DOUBLER Ig	6	MOD.
TRIPLER Ig	7	VOL. EXP.
PA Ig	8	TRIPLER Ip
OUTPUT	9	PA Ip
AVC		



ON

YING RELAY — K402 START-STOP RELAY

NTROL OF CARRIER CONTROL (VIIO) — A — PRIMARY POWER CONTROL OF TRANSFORMER T401

SCILLATOR KEYING — B

C — STANDARD REMOTE UNIT POWER INDICATOR CONTROL

RRIER CONTROL RELAY — D — HOLDING VOLTAGE FOR COIL K402

ATED RECEIVER AUDIO CONTROL

INDICATOR (I402) CONTROL — K403 ANTENNA TRANSFER RELAY

GRID GROUND CONTROL

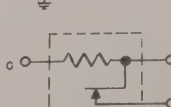
00 V. SUPPLY VOLTAGE (SEE FIG. 2-11)

SUPPLY REGULATION (SEE FIG. 2-11)

RD REMOTE UNIT

R INDICATOR CONTROL

SUPPLY REGULATION (E FIG. 2-11)

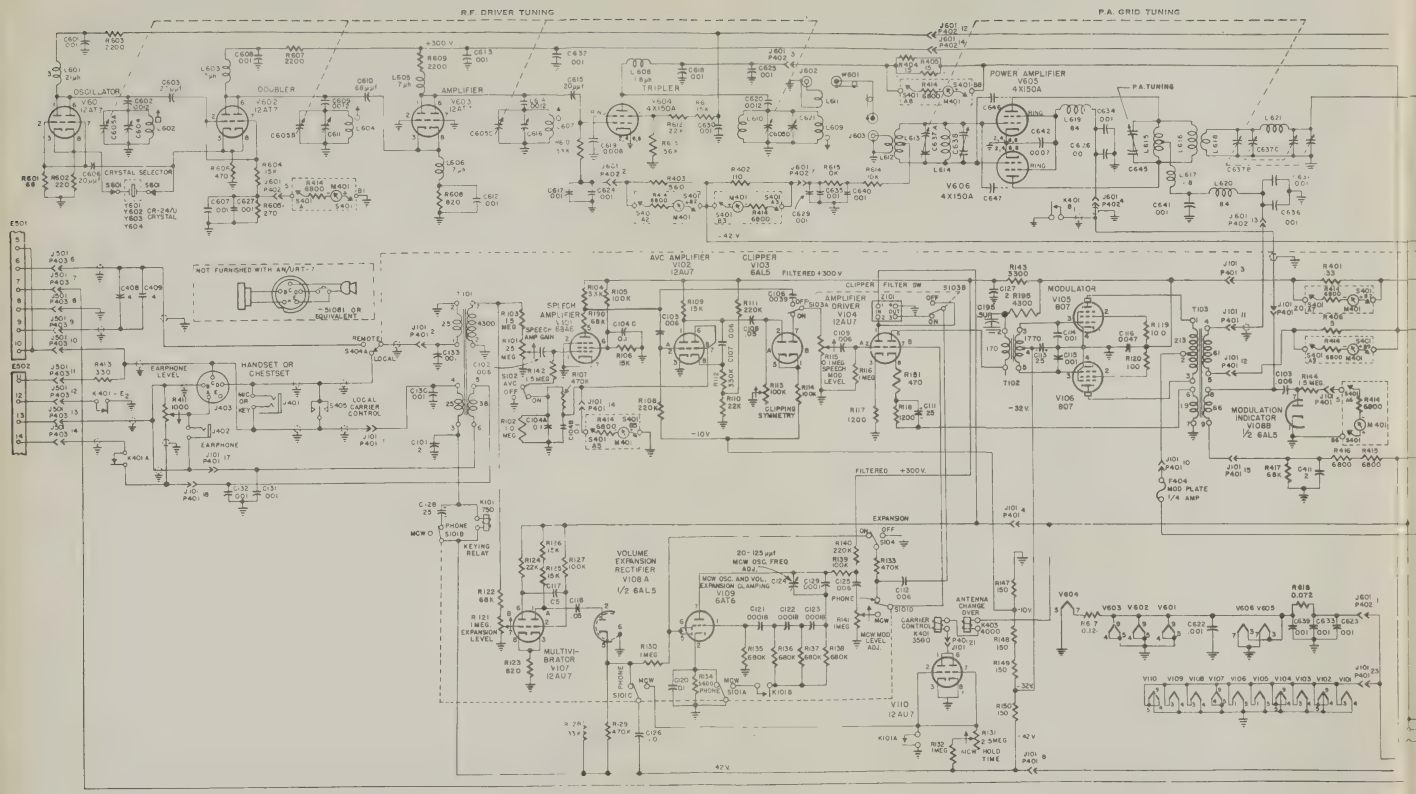


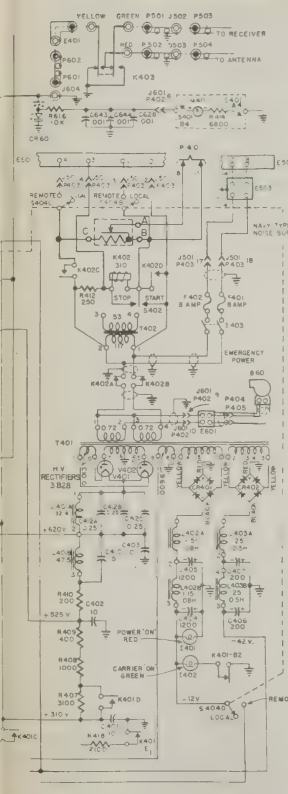
THERMAL CUT-OUT RELAY K404

OPERATION, THE START SWITCH
D CLOSED IF THE THERMOSTAT
LOSED.

er T-336B/URT-7 Schematic Diagram

7-38C
7-38D





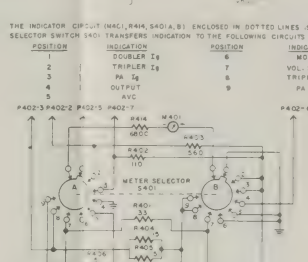
NOTES

1. CAPACITOR VALUES IN MICROFARADS EXCEPT WHERE OTHERWISE NOTED. RESISTOR VALUES IN OHMS EXCEPT WHERE OTHERWISE NOTED. K=1000 OHMS
2. ALL WAFER SWITCHES SHOWN IN NORMAL OPERATING POSITION
3. ALL RELAYS SHOWN DEENERGIZED
4. ARROW ACROSS ARM OF POTENTIOMETER SHOWS DIRECTION OF CLOCKWISE ROTATION FACING SHAFT END
5. THIS DIAGRAM IS DRAWN FOR 115V AC OPERATION. FOR 230V OPERATION SEE FIG 7-31
6. DC RESISTANCE OF COILS AND TRANSFORMER WINDINGS IS LESS THAN ONE-OHM UNLESS OTHERWISE NOTED. NUMBER WITH ARROW REFERS TO TOTAL DC RESISTANCE OF THE WHOLE WINDING IN OHMS

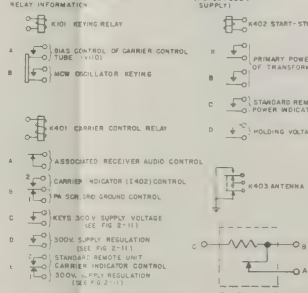
SPARE TERMINALS		GROUNDED TERMINALS	
P401	9, 13, 16, 19, 22	P403	5, 15, 16
J101		J501	
		ESC2	5, 16, 19, 20
		P401	6, 7
		J101	
		P402	15
		J601	

8. THE INDICATOR CIRCUIT (M401, R414, S401A, B) ENCLOSED IN DOTTED LINES IS SHOWN FUNCTIONALLY. SELECTOR SWITCH S401 TRANSFERS INDICATION TO THE FOLLOWING CIRCUITS

POSITION	INDICATION	POSITION	INDICATION
1	DOUBLER I_g	6	MOD.
2	TRIPLER I_g	7	VOL. EXP
3	PA I_g	8	TRIPLER I_p
4	OUTPUT	9	PA I_p
5	AVC		



9. RELAY INFORMATION


K101 KEYING RELAY
A BIAS CONTROL OF CARRIER CONTROL TUBE (V101)
B MCW OSCILLATOR KEYING
K401 CARRIER CONTROL RELAY
A ASSOCIATED RECEIVER AUDIO CONTROL
B CARRIER INDICATOR (T402) CONTROL
PA SCREEN GROUND CONTROL
C KEYS 300 V SUPPLY VOLTAGE (SEE FIG 2-11)
D 300V SUPPLY REGULATION (SEE FIG 2-11)
L STANDBY REMOTE UNIT CARRIER INDICATOR CONTROL
300V SUPPLY REGULATION (SEE FIG 2-11)
K402 START-STOP RELAY
B PRIMARY POWER CONTROL OF TRANSFORMER T401
C STANDARD REMOTE UNIT POWER INDICATOR CONTROL
D HOLDING VOLTAGE FOR COIL K402
K403 ANTENNA TRANSFER RELAY
THERMAL CUT-OUT RELAY K404

10. FOR EMERGENCY OPERATION, THE START SWITCH S10A, CAN BE HELD CLOSED IF THE THERMOSTAT DOES NOT STAY CLOSED

7-38C
7-38D

CHANGE 2

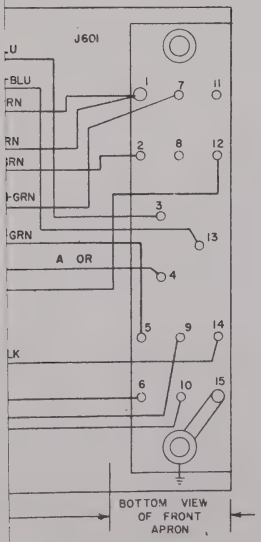
Figure 7—28B. Radio Transmitter T-336B/URT-7 Schematic Diagram

TION

C637C F
CONNECTE
BY A SO

WIRE LEGEND

A NO. 22 STRANDED WIRE TYPE SRIR (COVERED)
B NO. 18 " " " " "
C NO. 20 " " " " (UNCOVERED)
D NO. 22 SOLID BUS WIRE WITH SLEEVING
E COAXIAL OUTPUT CABLE RG-58/U
F MOTOR CABLE PART OF MOTOR
G NO. 14 SOLID BARE BUS WIRE WITH SILVER JACKET
W601 COAXIAL INTERCONNECTING CABLE RG-58/U



Oscillator AM-638/URT, Wiring Diagram

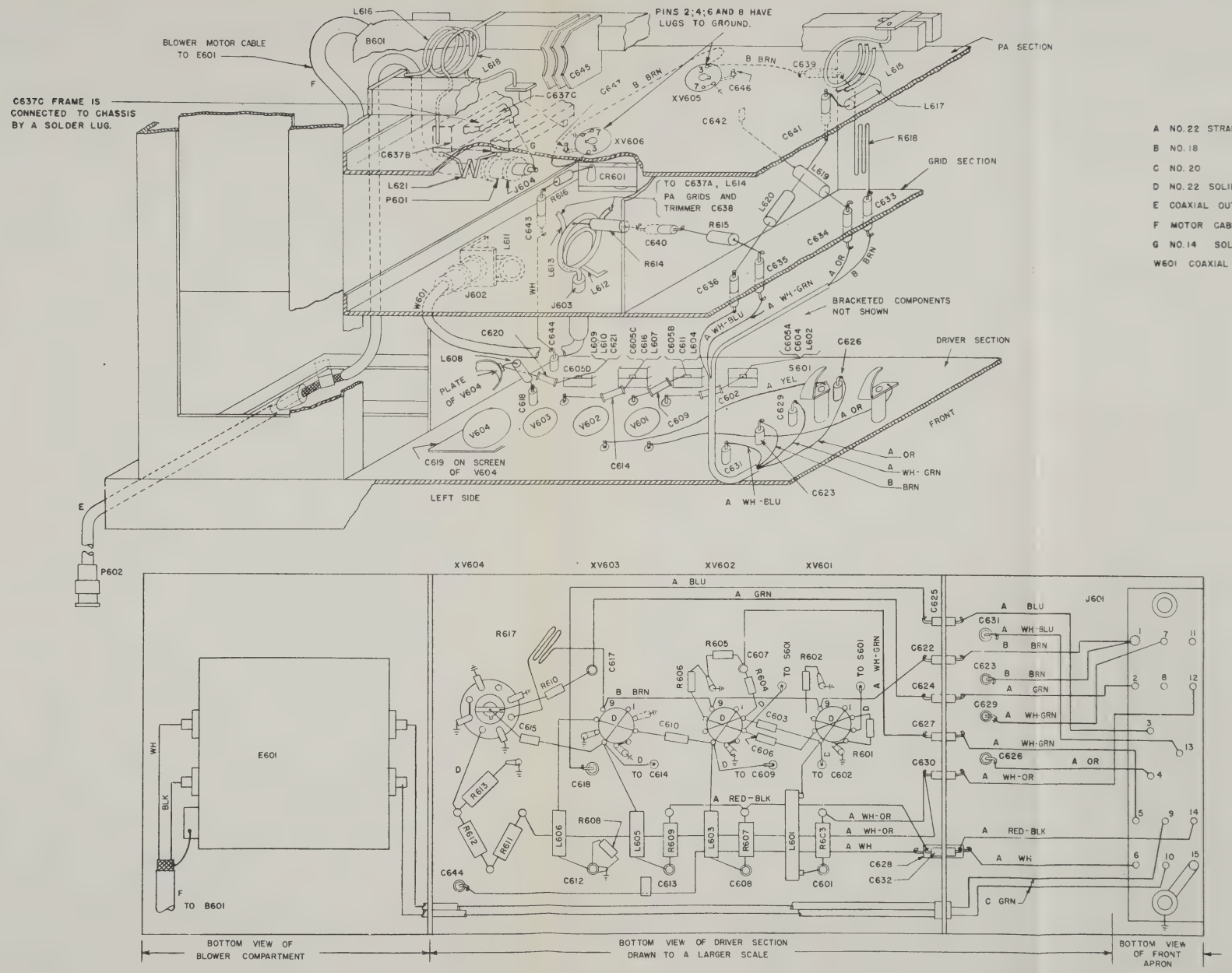
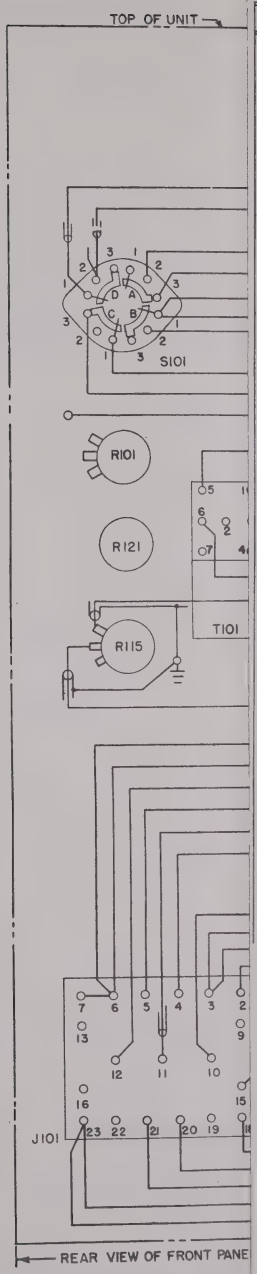

BLOWER MOTOR CABLE TO E601
C637C FRAME IS CONNECTED TO CHASSIS BY A SOLDER LUG.
PINS 2;4;6 AND 8 HAVE LUGS TO GROUND.
PA SECTION
GRID SECTION
DRIVER SECTION
BRACKETED COMPONENTS NOT SHOWN
TO C637A, L614
PA GRIDS AND TRIMMER C638
PLATE OF V604
C619 ON SCREEN OF V604
LEFT SIDE
FRONT
WIRE LEGEND
A NO.22 STRANDED WIRE TYPE SRIR (COVERED)
B NO.18 " " " " "
C NO.20 " " " " (UNCOVERED)
D NO.22 SOLID BUS WIRE WITH SLEEVING
E COAXIAL OUTPUT CABLE RG-58/U
F MOTOR CABLE PART OF MOTOR
G NO.14 SOLID BARE BUS WIRE WITH SILVER JACKET
W601 COAXIAL INTERCONNECTING CABLE RG-58/U
XV604
XV603
XV602
XV601
E601
TO B601
TO C614
TO C609
TO C602
TO S601
J601
BOTTOM VIEW OF BLOWER COMPARTMENT
BOTTOM VIEW OF DRIVER SECTION DRAWN TO A LARGER SCALE
BOTTOM VIEW OF FRONT APRON

Figure 7–29. Amplifier-Oscillator AM-638/URT, Wiring Diagram



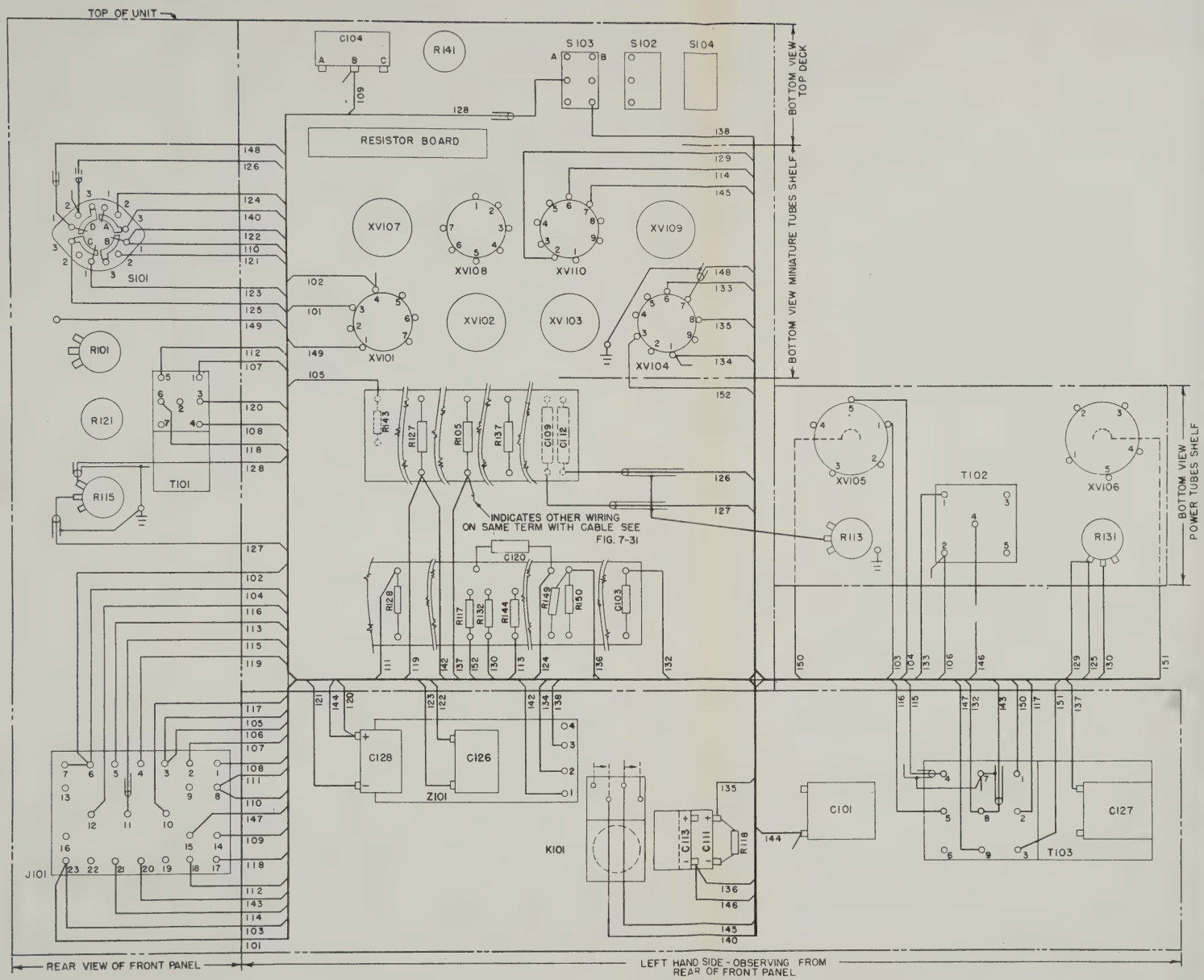
WIRE LEGEND

WIRE No.	FROM	TO	DESCRIPTION
101	J101-23	XV101-3	No 18 AWG BR
102	" -6	" -4	" " BLK-WH
103	" -23	XV105-1	" " BR
104	" -6	" -5	" " BLK-WH
105	" -3	R143	No 22 " OR
106	" -3	T102-2	" " OR
107	" -2	T101-1	" " WH-BR
108	" -1	T101-4	" " WH-GN
109	" -14	C104-B	" " WH-RD
110	" -8	S101-B1	" " WH
111	" -8	R128	" " WH
112	" -18	T101-5	" " WH-BL
113	" -5	R144	" " BL-WH
114	" 21	XV110-6	" " BL
115	" -11	T103-4	No 22 SHIELDED WH-OR
116	" -12	T103-5	No 22 AWG RD-WH
117	" -10	T103-2	" " RD
118	" -17	T101-6	" " WH-BLK
119	" -4	R127	" " RD-BL
120	T101-3	C128+	" " WH-OR
121	C128-	S101-B2	" " WH-BR
122	S101-B1	C126	" " WH-BL
123	S101-C1	C126	" " WH-OR
124	S101-A2	C120	" " YEL
125	S101-C3	R131	" " WH-BLK
126	S101-D2	C112	No 22 SHIELDED WH-OR
127	C109	R115	" " WH-YEL
128	S103-A	R115	" " WH-OR
129	R131	XV110-2	No 22 AWG GN
130	R132	R131	" " WH-RD
131			
132	C103	T103-8	No 22 AWG OR
133	XV104-6	T102-1	" " BL-WH
134	XV104-1	Z101-2	" " BL-RD
135	XV104-8	C111+	" " YEL
136	R149	C113-	" " WH-GN
137	R105	C127	" " RD
138	Z101-3	S103-B	" " WH-BLK
139			
140	K101	S101-A3	No 22 AWG WH-RD
141			
142	R127	Z101-1	No 22 AWG RD-BLK
143	J101-20	T103-8	No 22 SHIELDED WH-YEL
144	C128+	C101	No 22 AWG WH-OR
145	K101	XV110-7	" " GN
146	T102-4	C113-	" " WH-GN
147	J101-15	T103-9	WH-OR
148	S101-D1	XV104-7	No 22 SHIELDED WH-YEL
149	R101 CENTER	XV101-1	" " " "
150	T103-1	V105 CAP	No 18 AWG BL 2,500V
151	T103-3	V106 CAP	" " " "
152	R117	V104-3	No 22 " YEL

NOTE

REMAINDER OF WIRING (POINT TO POINT) SHOWN ON FIG. 7-31

adio Modulator MD-T63/URT,
n, Cabled Wiring Only

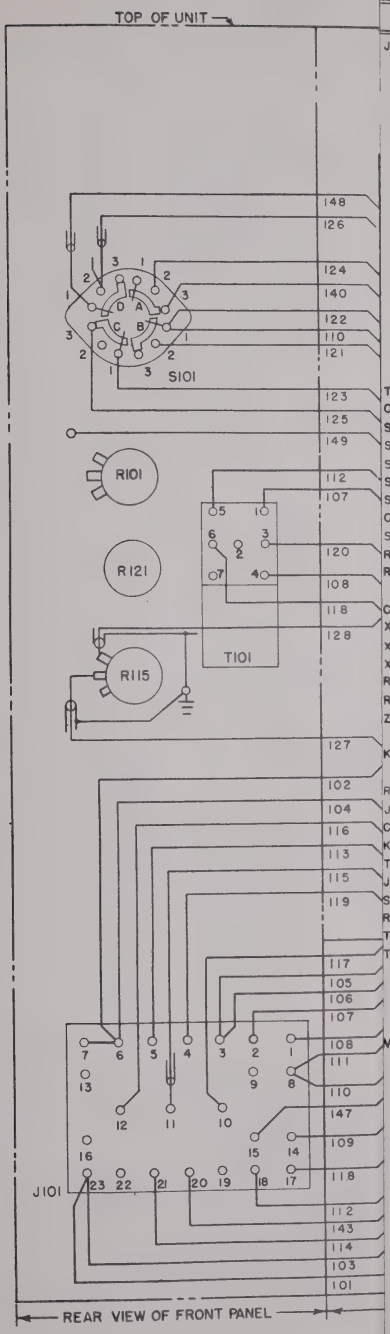

TOP OF UNIT
BOTTOM VIEW TOP DECK
BOTTOM VIEW MINIATURE TUBES SHELF
BOTTOM VIEW POWER TUBES SHELF
RESISTOR BOARD
INDICATES OTHER WIRING ON SAME TERM WITH CABLE SEE FIG. 7-31
REAR VIEW OF FRONT PANEL
LEFT HAND SIDE - OBSERVING FROM REAR OF FRONT PANEL

WIRE LEGEND

WIRE No.	FROM	TO	DESCRIPTION
101	J101-23	XV101-3	No 18 AWG BR
102	" -6	" -4	" " BLK-WH
103	" -23	XV105-1	" " BR
104	" -6	" -5	" " BLK-WH
105	" -3	R143	No 22 " OR
106	" -3	T102-2	" " OR
107	" -2	T101-1	" " WH-BR
108	" -1	T101-4	" " WH-GN
109	" -14	C104-B	" " WH-RD
110	" -8	S101-B1	" " WH
111	" -8	R128	" " WH
112	" -18	T101-5	" " WH-BL
113	" -5	R144	" " BL-WH
114	" 21	XV110-6	" " BL
115	" -11	T103-4	No 22 SHIELDED WH-OR
116	" -12	T103-5	No 22 AWG RD-WH
117	" -10	T103-2	" " RD
118	" -17	T101-6	" " WH-BLK
119	" -4	R127	" " RD-BLK
120	T101-3	C128+	" " WH-OR
121	C128-	S101-B2	" " WH-BR
122	S101-B1	C126	" " WH-BL
123	S101-C1	C126	" " WH-OR
124	S101-A2	C120	" " YEL
125	S101-C3	R131	" " WH-BLK
126	S101-D2	C112	No 22 SHIELDED WH-OR
127	C109	R115	" " WH-YEL
128	S103-A	R115	" " WH-OR
129	R131	XV110-2	No 22 AWG GN
130	R132	R131	" " WH-RD
131			
132	C103	T103-8	No 22 AWG OR
133	XV104-6	T102-1	" " BL-WH
134	XV104-1	Z101-2	" " BL-RD
135	XV104-8	C111+	" " YEL
136	R149	C113-	" " WH-GN
137	R105	C127	" " RD
138	Z101-3	S103-B	" " WH-BLK
139			
140	K101	S101-A3	No 22 AWG WH-RD
141			
142	R127	Z101-1	No 22 AWG RD-BLK
143	J101-20	T103-8	No 22 SHIELDED WH-YEL
144	C128+	C101	No 22 AWG WH-OR
145	K101	XV110-7	" " GN
146	T102-4	C113-	" " WH-GN
147	J101-15	T103-9	WH-OR
148	S101-D1	XV104-7	No 22 SHIELDED WH-YEL
149	R101 CENTER	XV101-1	" " " "
150	T103-1	V105 CAP	No 18 AWG BL 2,500V
151	T103-3	V106 CAP	" " " "
152	R117	V104-3	No 22 " YEL

NOTE
REMAINDER OF WIRING (POINT TO POINT) SHOWN ON FIG. 7-31

Figure 7–30. Radio Modulator MD-163/URT, Wiring Diagram, Cabled Wiring Only



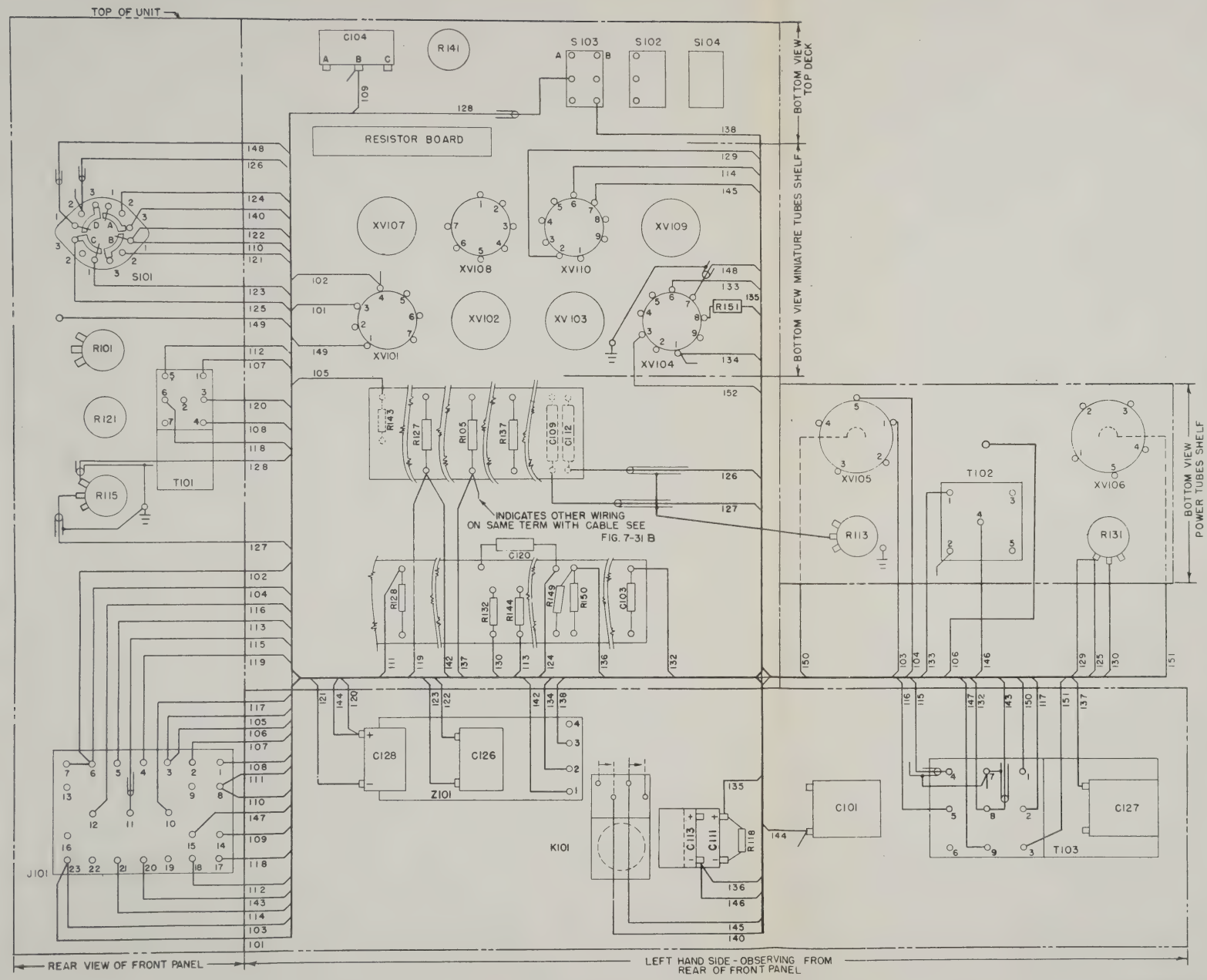
WIRE LEGEND

FROM	TO	DESCRIPTION
J101-23	XV101-3	Nº 18 AWG BR
" -6	" -4	" " BLK-WH
" -23	XV105-1	" " BR
" -6	" -5	" " BLK-WH
" -3	R143	Nº 22 " OR
" -3	TERM. POINT	" " OR
" -2	T101-1	" " WH-BR
" -1	T101-4	" " WH-GN
" -14	C104-B	" " WH-RD
" -8	S101-B1	" " WH
" -8	R128	" " WH
" -18	T101-5	" " WH-BL
" -5	R144	" " BL-WH
" 21	XV110-6	" " BL
" -11	T103-4	Nº 22 SHIELDED WH-OR
" -12	T103-5	Nº 22 AWG RD-WH
" -10	T103-2	" " RD
" -17	T101-6	" " WH-BLK
" -4	R127	" " RD-BLK
T101-3	C128+	" " WH-OR
C128-	S101-B2	" " WH-BR
S101-B1	C126	" " WH-BL
S101-C1	C126	" " WH-OR
S101-A2	C120	" " YEL
S101-C3	R131	" " WH-BLK
S101-D2	C112	Nº 22 SHIELDED WH-OR
C109	R115	" " WH-YEL
S103-A	R115	" " WH-OR
R131	XV110-2	Nº 22 AWG GN
R132	R131	" " WH-RD
C103	T103-8	Nº 22 AWG OR
XV104-6	T102-1	" " BL-WH
XV104-1	Z101-2	" " BL-RD
XV104-8	C111+	" " YEL
R149	C113-	" " WH-GN
R105	C127	" " RD
Z101-3	S103-B	" " WH-BLK
K101	S101-A3	Nº 22 AWG WH-RD
R127	Z101-1	Nº 22 AWG RD-BLK
J101-20	T103-8	Nº 22 SHIELDED WH-YEL
C128+	C101	Nº 22 AWG WH-OR
K101	XV110-7	" " GN
T102-4	C113-	" " WH-GN
J101-15	T103-9	WH-OR
S101-D1	XV104-7	Nº 22 SHIELDED WH-YEL
R101 CENTER	XV101-1	" " " "
T103-1	V105 CAP	Nº 18 AWG BL 2,500V
T103-3	V106 CAP	" " " "

MAINDER OF WIRING (POINT TO POINT) SHOWN ON FIG. 7-31B

7-42A
7-42B

3B/URT Wiring Diagram, Cabled Wiring Only



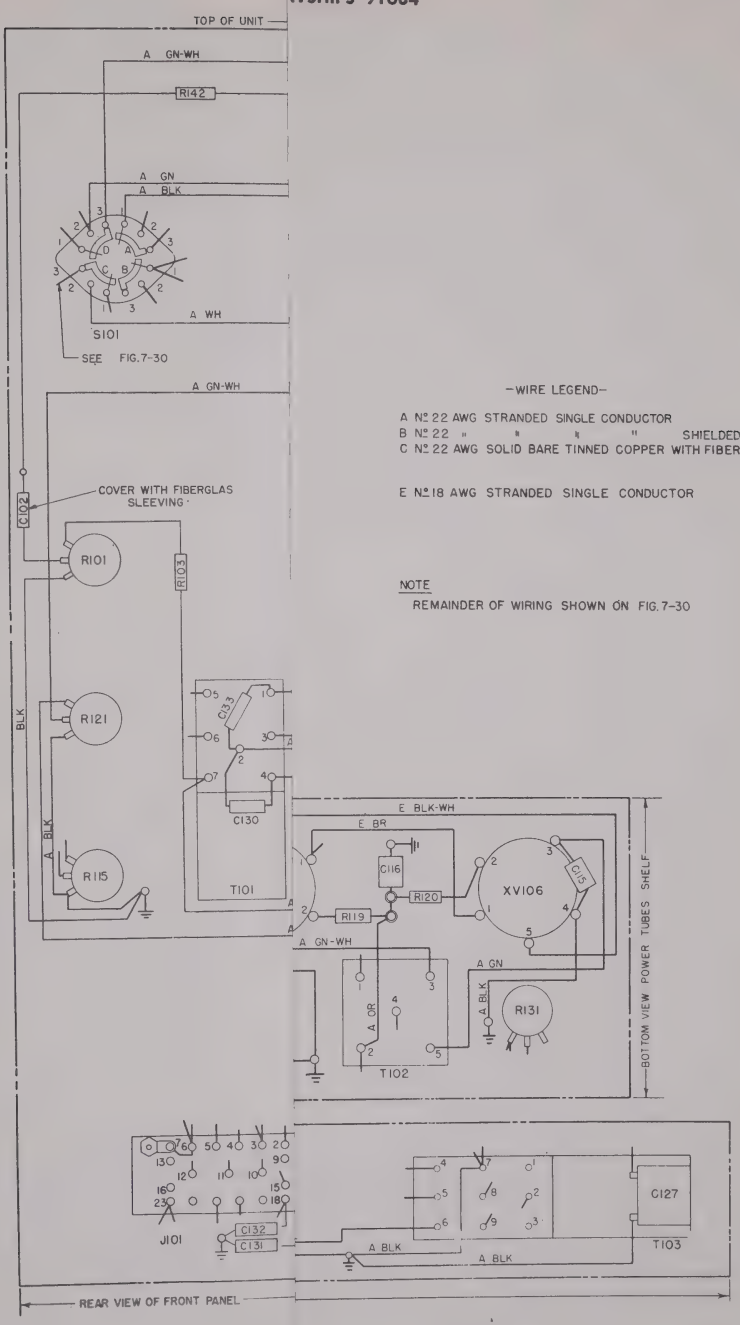
WIRE LEGEND

WIRE N°	FROM	TO	DESCRIPTION
101	J101-23	XV101-3	N° 18 AWG BR
102	" -6	" -4	" " BLK-WH
103	" -23	XV105-1	" " BR
104	" -6	" -5	" " BLK-WH
105	" -3	R143	N° 22 " OR
106	" -3	TERM. POINT	" " OR
107	" -2	T101-1	" " WH-BR
108	" -1	T101-4	" " WH-GN
109	" -14	C104-B	" " WH-RD
110	" -8	S101-B1	" " WH
111	" -8	R128	" " WH
112	" -18	T101-5	" " WH-BL
113	" -5	R144	" " BL-WH
114	" 21	XV110-6	" " BL
115	" -11	T103-4	N° 22 SHIELDED WH-OR
116	" -12	T103-5	N° 22 AWG RD-WH
117	" -10	T103-2	" " RD
118	" -17	T101-6	" " WH-BLK
119	" -4	R127	" " RD-BLK
120	T101-3	C128+	" " WH-OR
121	C128-	S101-B2	" " WH-BR
122	S101-B1	C126	" " WH-BL
123	S101-C1	C126	" " WH-OR
124	S101-A2	C120	" " YEL
125	S101-C3	R131	" " WH-BLK
126	S101-D2	C112	N° 22 SHIELDED WH-OR
127	C109	R115	" " WH-YEL
128	S103-A	R115	" " WH-OR
129	R131	XV110-2	N° 22 AWG GN
130	R132	R131	" " WH-RD
131			
132	C103	T103-8	N° 22 AWG OR
133	XV104-6	T102-1	" " BL-WH
134	XV104-1	Z101-2	" " BL-RD
135	XV104-8	C111+	" " YEL
136	R149	C113-	" " WH-GN
137	R105	C127	" " RD
138	Z101-3	S103-B	" " WH-BLK
139			
140	K101	S101-A3	N° 22 AWG WH-RD
141			
142	R127	Z101-1	N° 22 AWG RD-BLK
143	J101-20	T103-8	N° 22 SHIELDED WH-YEL
144	C128+	C101	N° 22 AWG WH-OR
145	K101	XV110-7	" " GN
146	T102-4	C113-	" " WH-GN
147	J101-15	T103-9	WH-OR
148	S101-D1	XV104-7	N° 22 SHIELDED WH-YEL
149	R101 CENTER	XV101-1	" " " "
150	T103-1	V105 CAP	N° 18 AWG BL 2,500V
151	T103-3	V106 CAP	" " " "

NOTE
REMAINDER OF WIRING (POINT TO POINT) SHOWN ON FIG. 7-31B

7-42A
7-42B

Figure 7—30A. Radio Modulator MD-163B/URT Wiring Diagram, Cabled Wiring Only



—WIRE LEGEND—

A № 22 AWG STRANDED SINGLE CONDUCTOR
B № 22 " " " " SHIELDED
C № 22 AWG SOLID BARE TINNED COPPER WITH FIBERGLAS SLEEVING

E № 18 AWG STRANDED SINGLE CONDUCTOR

NOTE
REMAINDER OF WIRING SHOWN ON FIG. 7-30

dio Modulator MD-163/URT,
Point-to-Point Wiring Only

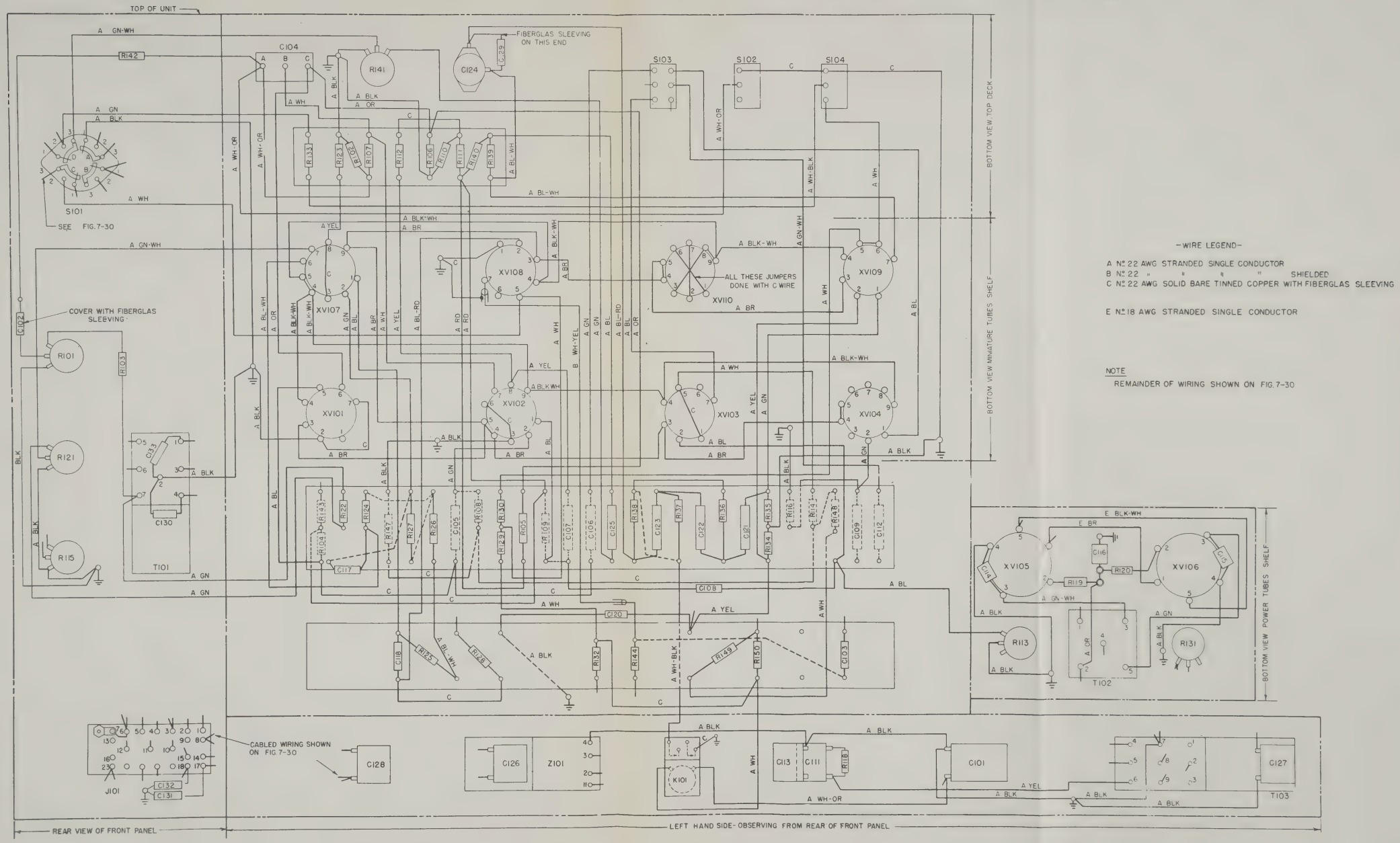
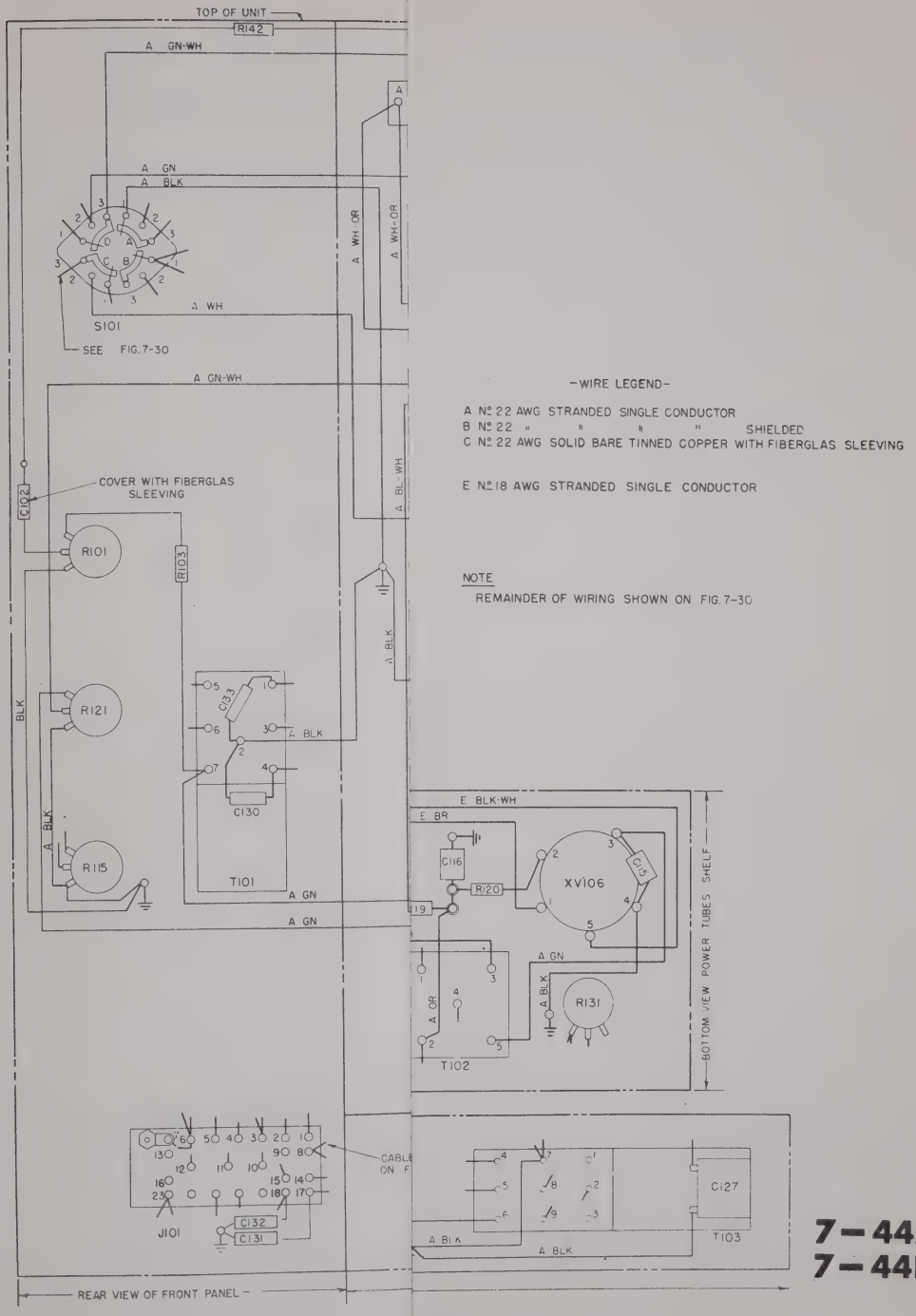

TOP OF UNIT
FIBERGLAS SLEEVING ON THIS END
COVER WITH FIBERGLAS SLEEVING
SEE FIG. 7-30
ALL THESE JUMPERS DONE WITH C WIRE
CABLED WIRING SHOWN ON FIG. 7-30
BOTTOM VIEW TOP DECK
BOTTOM VIEW MINIATURE TUBES SHELF
BOTTOM VIEW POWER TUBES SHELF
REAR VIEW OF FRONT PANEL
LEFT HAND SIDE-OBSERVING FROM REAR OF FRONT PANEL
-WIRE LEGEND-
A Nº 22 AWG STRANDED SINGLE CONDUCTOR
B Nº 22 " " " " SHIELDED
C Nº 22 AWG SOLID BARE TINNED COPPER WITH FIBERGLAS SLEEVING
E Nº 18 AWG STRANDED SINGLE CONDUCTOR
NOTE
REMAINDER OF WIRING SHOWN ON FIG. 7-30

Figure 7–31. Radio Modulator MD-163/URT, Wiring Diagram, Point-to-Point Wiring Only



-WIRE LEGEND-

A Nº 22 AWG STRANDED SINGLE CONDUCTOR
B Nº 22 " " " " SHIELDED
C Nº 22 AWG SOLID BARE TINNED COPPER WITH FIBERGLAS SLEEVING

E Nº 18 AWG STRANDED SINGLE CONDUCTOR

NOTE
REMAINDER OF WIRING SHOWN ON FIG. 7-30

7-44A
7-44B

, Wiring Diagram, Point-to-Point Wiring Only

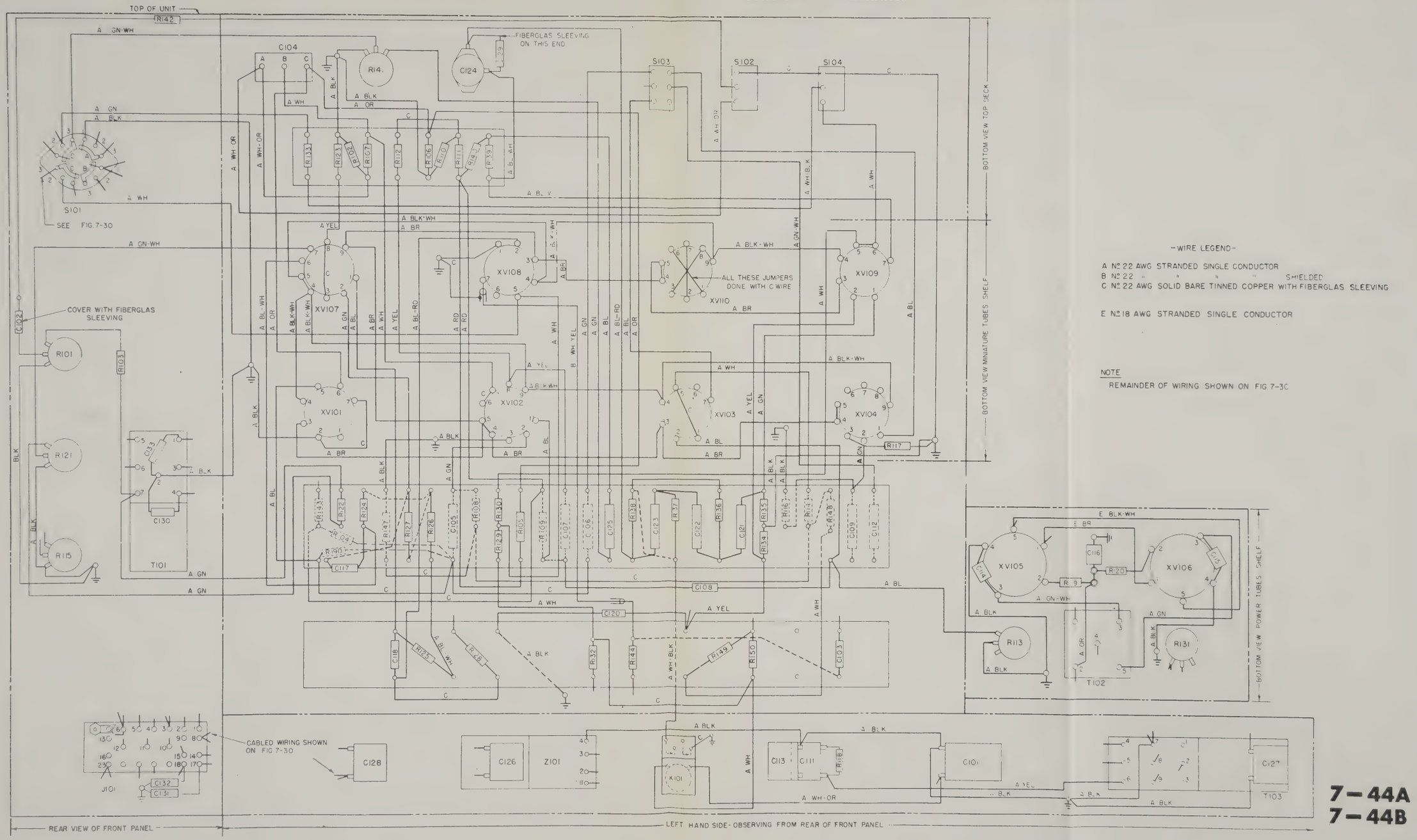
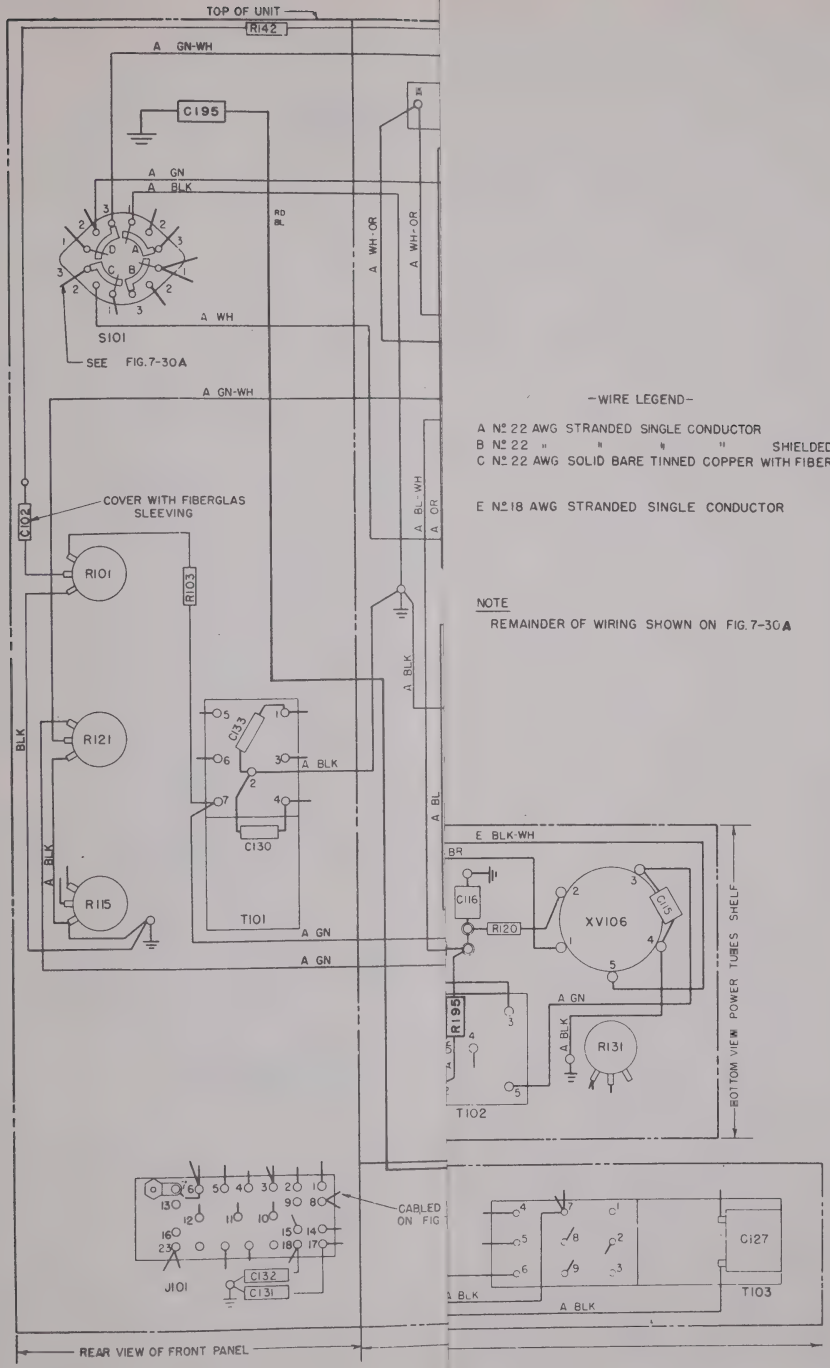


Figure 7-31A. Radio Modulator MD-163A/URT, Wiring Diagram, Point-to-Point Wiring Only



-WIRE LEGEND-

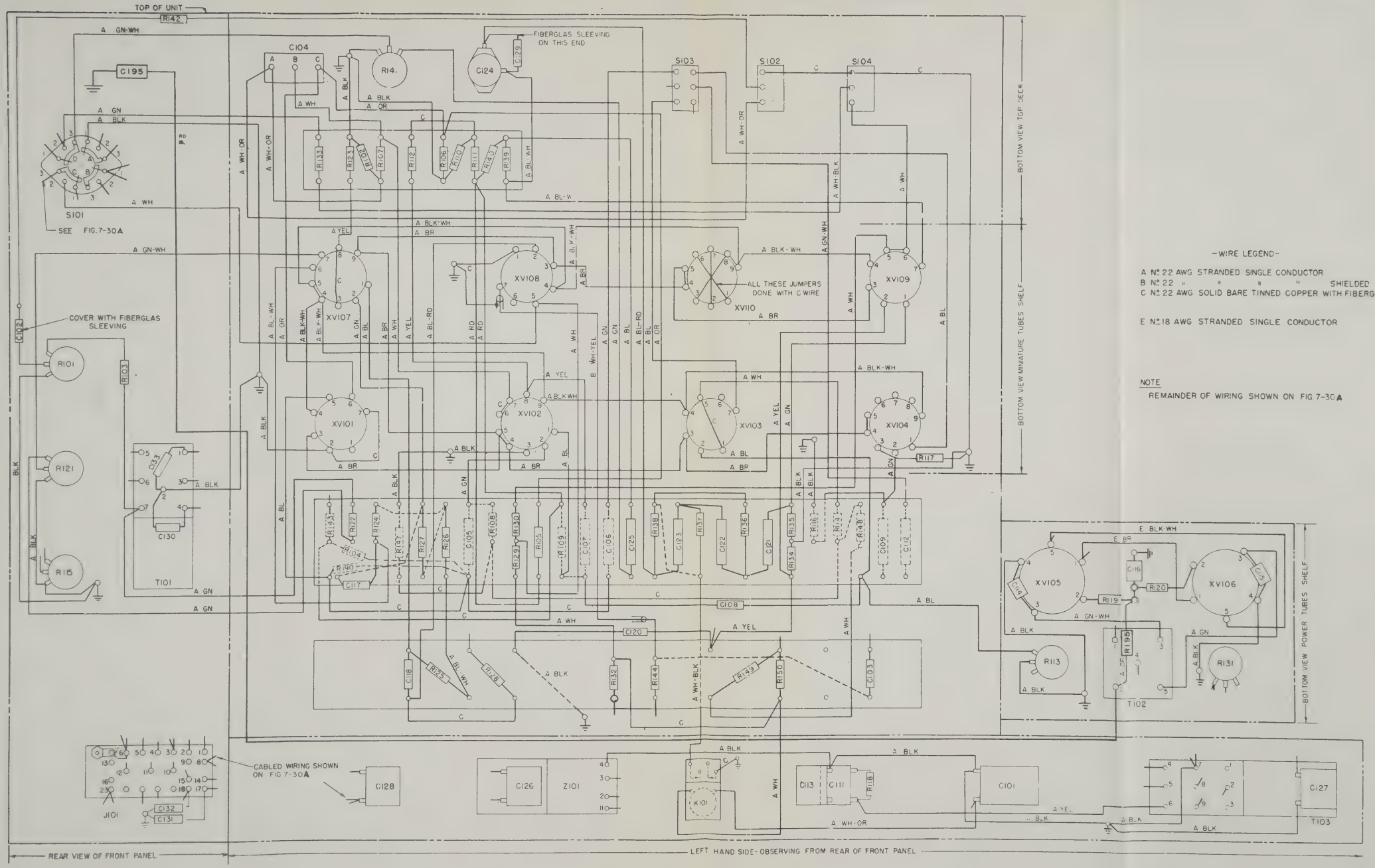
A N° 22 AWG STRANDED SINGLE CONDUCTOR
B N° 22 " " " " SHIELDED
C N° 22 AWG SOLID BARE TINNED COPPER WITH FIBERGLAS SLEEVING

E N° 18 AWG STRANDED SINGLE CONDUCTOR

NOTE
REMAINDER OF WIRING SHOWN ON FIG. 7-30A

7-44C
7-44D

, Wiring Diagram, Point-to-Point Wiring Only



-WIRE LEGEND-

A No. 22 AWG STRANDED SINGLE CONDUCTOR
B No. 22 " " " " SHIELDED
C No. 22 AWG SOLID BARE TINNED COPPER WITH FIBERGLAS SLEEVING

E No. 18 AWG STRANDED SINGLE CONDUCTOR

NOTE
REMAINDER OF WIRING SHOWN ON FIG. 7-30A

Figure 7—31B. Radio Modulator MD-163B/URT, Wiring Diagram, Point-to-Point Wiring Only

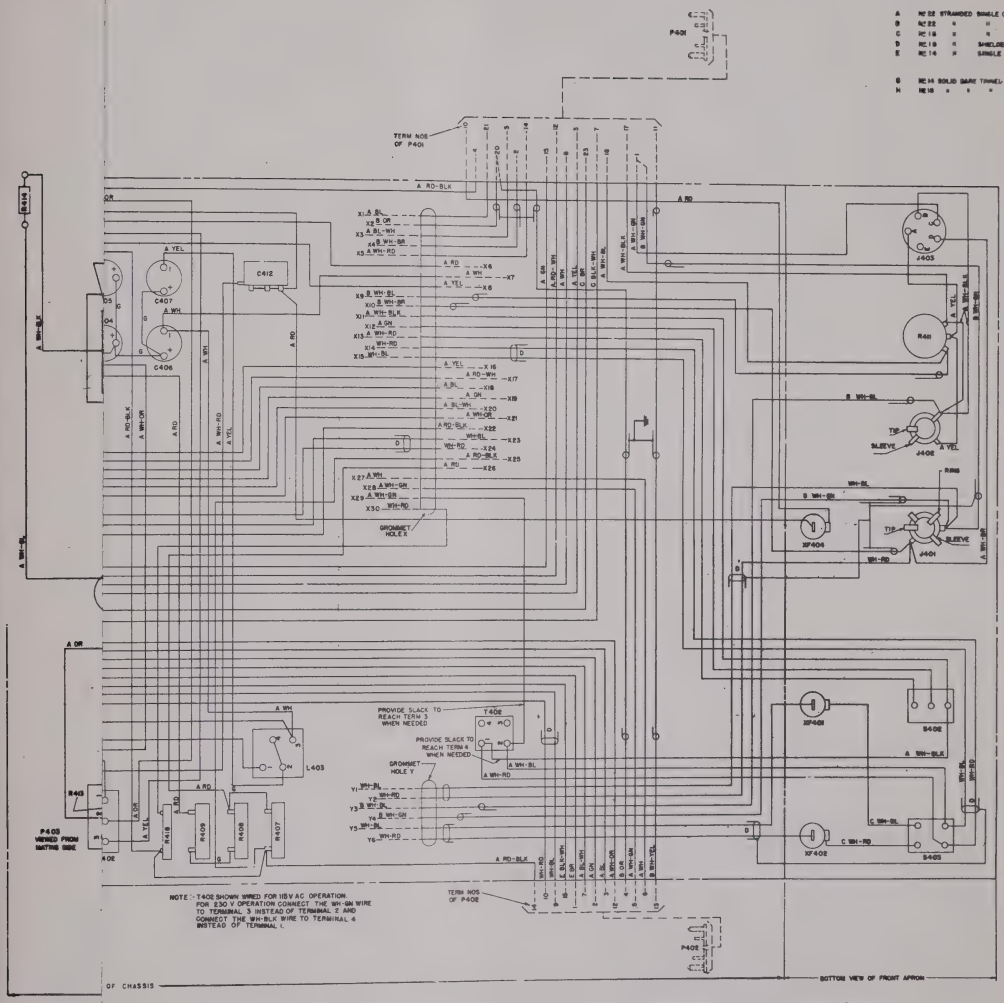


Figure 7–32. Power Supply PP-773/URT, Wiring Diagram

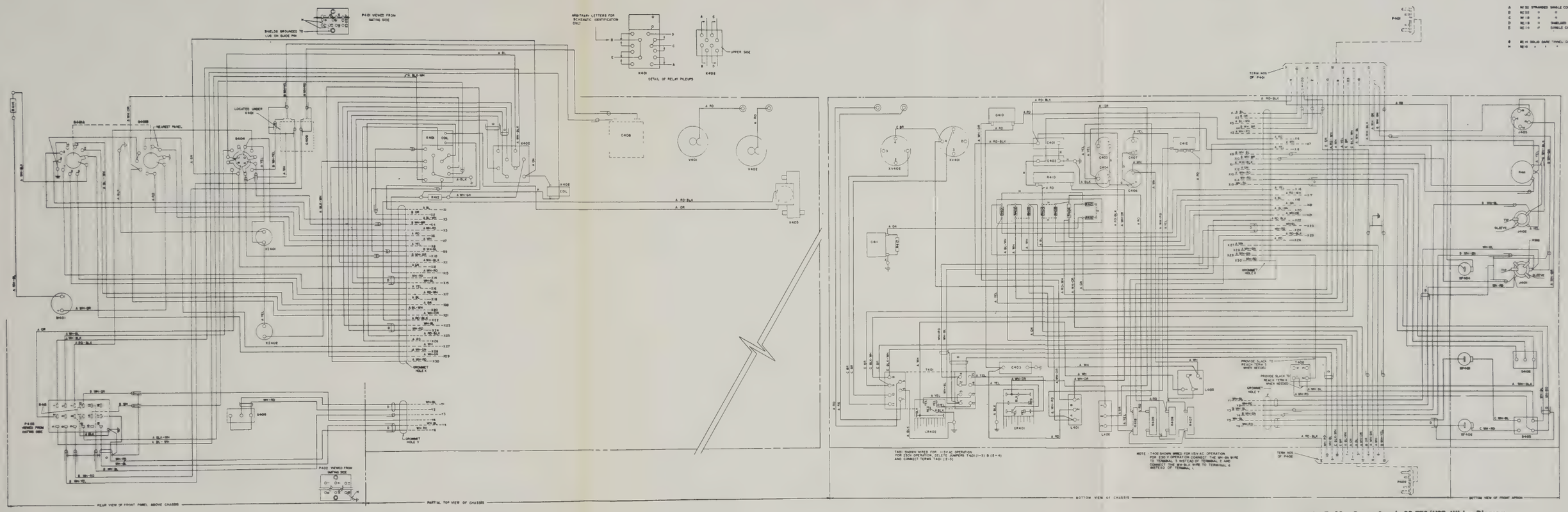
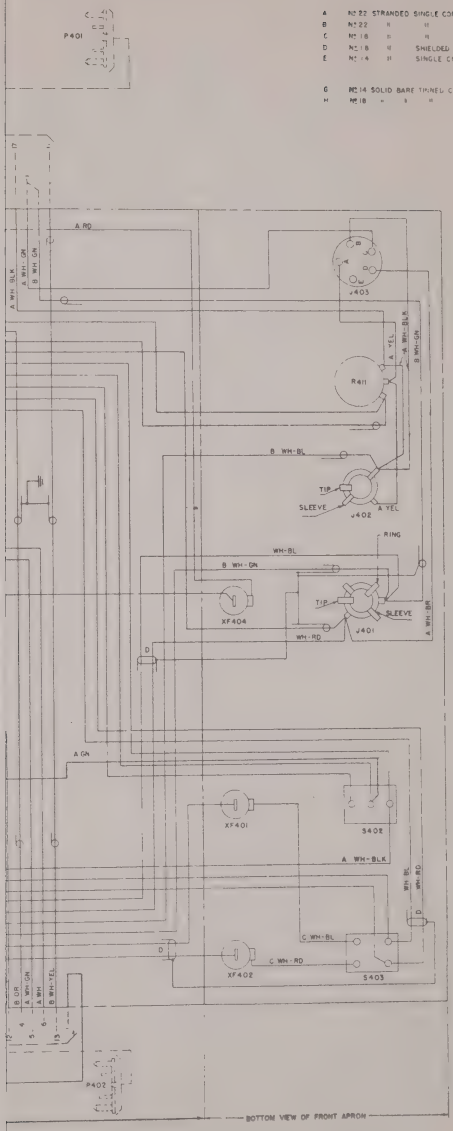

P401 VIEWED FROM MATING SIDE
SHIELDS GROUNDED TO LUG ON GUIDE PIN
ARBITRARY LETTERS FOR SCHEMATIC IDENTIFICATION ONLY
K401
K408
UPPER SIDE
DETAIL OF RELAY PILEUPS
LOCATED UNDER K401
REAR VIEW OF FRONT PANEL ABOVE CHASSIS
PARTIAL TOP VIEW OF CHASSIS
P402 VIEWED FROM MATING SIDE
GROMMET HOLE X
GROMMET HOLE Y
TERM NOS OF P401
BOTTOM VIEW OF CHASSIS
BOTTOM VIEW OF FRONT APRON
GROMMET HOLE Z
PROVIDE SLACK TO REACH TERM 2 WHEN HINGED
PROVIDE SLACK TO REACH TERM 5 WHEN HINGED
TERM NOS OF P402
T401 SHOWN WIRED FOR 115V AC OPERATION. FOR 230V OPERATION, DELETE JUMPER T401 (1-3) & (2-4) AND CONNECT TERMS T401 (1-3)
NOTE: T402 SHOWN WIRED FOR 115V AC OPERATION. FOR 230 V OPERATION CONNECT THE WH-BN WIRE TO TERMINAL 5 INSTEAD OF TERMINAL 2 AND CONNECT THE WH-BLK WIRE TO TERMINAL 6 INSTEAD OF TERMINAL 1.

Figure 7–32. Power Supply PP-773/URT, Wiring Diagram



Supply PP-773B/URT, Wiring Diagram

7–46A
7–46B

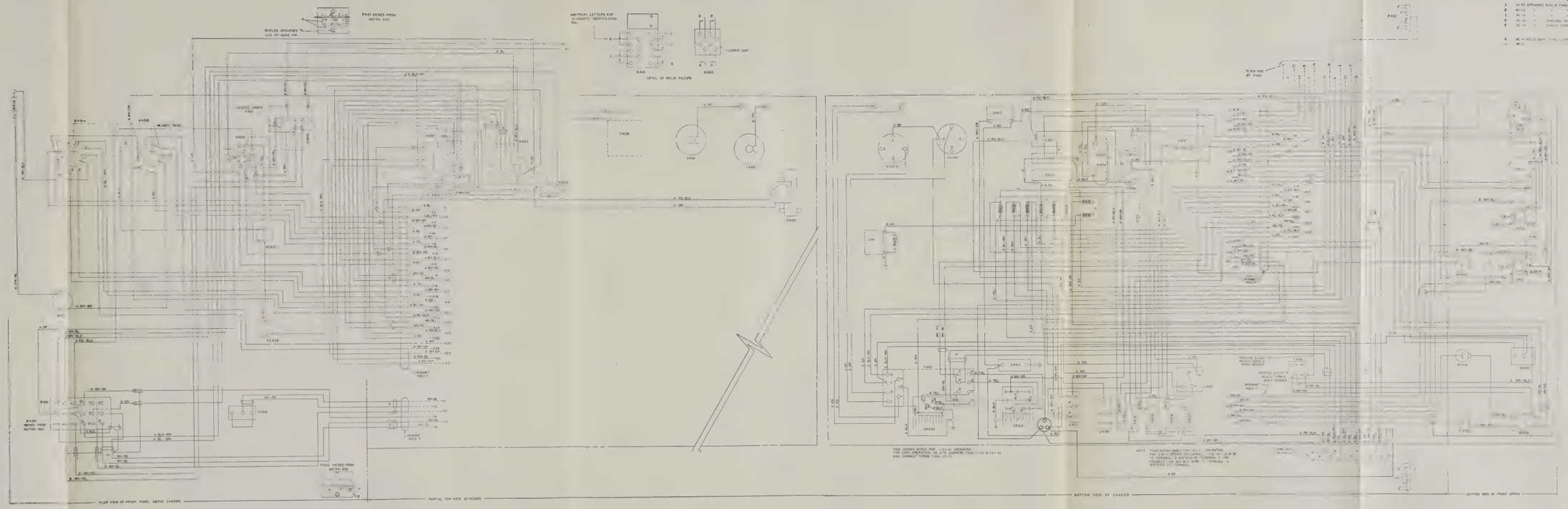


Figure 7—32A. Power Supply PP-773B/URT, Wiring Diagram

7—46A
7—46B

SECTION 8
PARTS AND SPARE PARTS LISTS (AND MISCELLANEOUS TABLES)

TABLE 8–1. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	DESIGNATION	STANDARD NAVY STOCK NUMBER FOR AN/URT-7
	1	Transmitter, Radio	T-336/URT-7	16-T-37275-1301
101-199	1	Modulator, Radio	MD-163/URT	16-M-42244-1875
301-399	1	Cable Assembly Set		
401-499	1	Power Supply	PP-773/URT	16-P-68314-1001
501-599	1	Cabinet, Electrical Equipment	CY-1126/URT	16-C-10629-1689
601-699	1	Amplifier-Oscillator	AM-638/URT	16-A-39380-1007

TABLE 8—1A. TABLE OF REPLACEABLE PARTS APPLICABLE TO MODEL T-336A/URT-7

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
A503**		GASKET: 1/32 in. thk; 50-60 duro-meter moulded neoprene; rectangular aperature 6-1/4 in. lg. by 3-15/16 in., w; 1/2 in. w bearing surface; 13 mtg holes, 3/16 in dia; RAQA Dwg. No. QR-0293	Separates Cabinet and Terminal Housing
A607**		GASKET: 1/32 in. thk; 50-60 duro-meter moulded neoprene; 8-11/16 in. lg. by 4-3/4 in. w overall; 6-9/16 in. lg. by 4 in. w aperature; four 7/32 in. dia. mtg holes on 8-1/16 in. by 3-3/8 in. centers; RAQA Dwg. No. QR-0290	Air Filter Holder
A608**	N17-C-794001-228	CLEANER, AIR: RAQA Dwg. No. AG-4380	Dust Cleaner For Blower B601
A609**		CONTACT, ELECTRICAL: 1-7/32 in. lg. by 3/8 in. w by 5/16 in. high overall. RAQA Dwg. No. AG-4415	Contact For CR-601
B601**		BLOWER: Centrifugal wave fan; single unit operating on a common shaft. Prime mover supplied with unit, electric motor, 115 VAC, 50 to 60 cycles, single phase, 1.45 amp, 7500 rpm p/m 200 rpm; transmitter cooling; American Blower part No. K17200. RAQA Dwg. No. PG-0009	Cools Transmitter
C118**	N16-C-44287-6667	CAPACITOR, FIXED, PAPER DIELECTRIC: JAN-C-25 type No. and RAQA Dwg. No. CP29A1EF503M	Volume Expander Coupling
C619D**		PLATE, ELECTRICAL CONNECTOR: silver plated brass; 2-1/4 in. lg. x 2-1/4 in. wide x .064 in. thk; 1-5/8 in. dia. center holes; RAQA Dwg. No. AG-4624	P/O C 619
C642D**		PLATE, ELECTRICAL CONNECTOR: Silver plated brass; 4-1/2 in. lg. x 3-3/4 in. wide x 1/8 in. high overall; RAQA Dwg. No. VG-2911	P/O C 642
E107**	N17-C-815501-118	CLIP, ELECTRICAL: phospher bronze, nickel plated; 3-1/2 in. lg. x 1 in. w x 9/16 in. high overall; melamine insulation; RAQA Dwg. No. VG-2760	Plate Cap For 807 Tubes
E402**		DIAL, CONTROL: RAQA Dwg. No. VG-2739	Control For Meter Selector Switch S401
E409-1** thru E409-2**	N17-C-814365-451	CLIP, ELECTRICAL: RAQA Dwg. No. VG-2742	Plate Cap For 3B28 Tubes
E612-1** thru E612-2**		NOT USED in model T-336A/URT-7	
E615-1** thru E615-2**	N17-B-99999-0236	BRUSH, ELECTRICAL CONTACT: square shape with 1/32 in. level on corners; 5/8 in. lg, 9/32 in. w, 9/32 in. thk; straight end, concave contact face; composition, electrographite grade 235; shunt and pressive spring, 1-1/4 in. lg; Universal Electric part No. 25A18A-2; RAQA Dwg. No. AG-4604	Brushes For B601**
E616-1** thru E616-2**	For reference only 3340-061875050	FORM, COIL: steatite; 1-3/4 in. lg. by 1/2 in. OD by 3/8 in. ID; RAQA Dwg. No. QC-0108	Used With L602 and L609

E617-1**	For reference only 3340-061875060	FORM, COIL: Same as E616 except 1-3/16 in. lg; RAQA Dwg. No. QC-0110	Used With L604 and L607
E618-1** thru E618-3**	For reference only	CORE, ADJUSTABLE TUNING: silver plated brass; .365 in. OD by 1-½ in. lg. overall; RAQA Dwg. No. VG-2752	
E619**	For reference only	CORE, ADJUSTABLE TUNING: iron core mtd on silver plated brass rod; .365 in. OD by 1-½ in. lg. overall; RAQA Dwg. No. QM-0003	U/W L602
E620-1** thru E620-2**	N17-I-49498-5595	INSULATOR, FEEDTHRU: steatite; shoulder type; 7/16 in. dia. by 3/16 in. high with .150 in. dia. hole in center; RAQA Dwg. No. QC-0111	P/O Mounting For CR-601 Output Rectifier
E621**	N17-I-47363-4222	INSULATOR, FEEDTHRU: female section; steatite; mates with E622; ⅜ in. OD by ¼ in. h, with .150 in. dia. center hole; RAQA Dwg. No. QR-0118	P/O Mounting For L618
E622**	N17-I-49485-1151	INSULATOR, FEEDTHRU: male section, steatite; ⅜ in. OD by ⅜ in. h with .150 dia. hole in center; mates with E621; RAQA Dwg. No. QC-0119	P/O Mounting For L618
H108**		TERMINAL, STUD: 9/16 in. lg. x ¼ in. dia. overall; RAQA Dwg. No. BG-1512	Support For R103 and C102
L615**		COIL, RADIO FREQUENCY: 3 turns #8 silver plated copper wire; single wound; 9/16 in. lg. by 2 in. w. by 1-¼ in. ID overall excluding terminals; RAQA Dwg. No. LW-0091	Power Ampl. Plate Tuning
L616**		COIL, RADIO FREQUENCY: 2-½ turns #8 silver plated copper wire; single wound; 9/16 in. lg. by 2 in. w. by ⅝ in. ID overall excluding term; RAQA Dwg. No. LW-0093	Power Ampl. Plate Tuning
L618**		COIL, RADIO FREQUENCY: 1 turn #11 nickel plus silver plated copper wire; air core; RAQA Dwg. No. LW-0089	Power Ampl. Output Coupling
O608-1** thru O608-2**	G77-B-111-00810-8440	BEARING: ball type; New Departure No. 99038; RAQA Dwg. No. BG-1509	Bearing For Blower B601**
R104**	N16-R-50417-823	RESISTOR, FIXED, COMPOSITION: RAQA and MIL-R-11 type No. RC20GF333K	P/O Speech Ampl. Plate Load
R114**	N16-R-50633-785	RESISTOR, FIXED, COMPOSITION: RAQA and MIL-R-11 type No. RC20GF104K	Clipper Cathode
R139**		Same as R114**	
R190**		Same as R122**	
XF403**		Same as XF401**	Spare Fuse Holder
XF405**		Same as XF401**	Spare Fuse Holder

** Used on Radio Transmitter T-336A/URT-7

TABLE 8—1B. TABLE OF REPLACEABLE PARTS APPLICABLE TO MODEL T-336B/URT-7

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C-195***		CAPACITOR, FIXED: PAPER; MIL type CP53B1EF504K; 500,000 uuf + 10%; 600 vdcw; spec MIL-C-25A	Bypass plate transient suppressor
C-619.1***	For reference only	CAPACITOR, FIXED, MICA DIELECTRIC: 800 mmf +20%, 300 VDC working; RAQA Dwg. No. VG-2921	
C-619.1-A***	N17-I-64046-1245	Same as C-619-B; p/o C-619.1	
C-619.1-C***	N17-C-79659 5001	Same as C-619-C; p/o C-619.1	
C-619.1-D***		Same as C-619-C; p/o C-619.1	
C-642.1***	For reference only	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 700 mmf, +20%, 500 VDC working; PA screen bypass; RAQA Dwg. No. VG-2880	
C-642.1-A***	N17-I-64144-3044	INSULATOR, PLATE: teflon dielectric; 4-7/32 in. lg by 3-3/8 in. w by .010 in. thk; non-std shape; two 2-1/8 in. dia holes; p/o C-642.1; RAQA Dwg. No. AC-1357	
C-642.1-B***	N17-I-64144 4546	INSULATOR, PLATE: teflon dielectric; 4-7/32 in. lg by 3-3/8 in. w by .010 in. thk; non-std shape; two 2-1/4 in dia holes; p/o C-642.1; RAQA Dwg. No. AC-1358	
C-642.1-C***	N17-C-814951-136	CLIP, ELECTRICAL: silver plated beryllium copper; 2-1/8 in. dia by 5/16 in. high overall; p/o C-642.1; RAQA Dwg. No. AG-4608	

C-642.1-D***	N16-P-403081-156	PLATE, CAPACITOR: silver plated copper alloy; 4-9/16 in. lg. by 3-7/8 in. w. by 1/8 in. high overall; p/o C-642.1; RAQA Dwg. No. VG-2874	
C-642.1-E***	N17-P-404181-271	PLATE CAPACITOR: silver plated brass; 4-9/16 in. lg by 3-1/4 in. w by 45/64 in. high overall; p/o C-642.1; RAQA Dwg. No. AG-4612	
C-642.1-F***		WASHER: silver plated brass; 2-1/8 in. OD by .032 in. thk overall; 1-5/8 in. OD: p/o C-642.1; RAQA Dwg. No. WJ-0256	
K403***		RELAY, ARMATURE: 2C contact arrangement; 4000 ohms p/m 10% DC coil resistance; 15 ma DC max; antenna changeover; RAQA Dwg. No. D-0089; interchangeable with K403 on previous equipments.	Antenna Changeover
K404***	N17-R-99999-0900	RELAY, THERMAL: spst; 115 VAC; 2000 -20% ohm heater element; 1-3/8 in. dia by 9/16 in. high overall; Reynolds Electric No. M4174; RAQA Dwg. No. D-0088; equipment over heating protection.	Equipment overheating protection
O-601.1-1***	N16-V-10551-1027	VENT, AIR: material, Revolite No. 1422 as mfr by Rey Corp; cylindrical with varying 1D; 1-3/16 in. lg by 1-3/4 in. OD; mounted by three tapped no. 6-32 thd holes parallel to axis and spaced 120 degrees apart on 1-1/2 in. dia. bolt circle; RAQA Dwg. No. AC-1356; guides air stream thru cooling fins of 4X150A electron tubes.	Guides Air Through Cooling Fins
P404***		CONNECTOR: type AN/3101A-12S-3P	
P405***		CONNECTOR: type AN/3106A-12S-3S	
R151***		Same as R606	Driver Cathode Bias
R195***		RESISTOR, FIXED; comp; MIL type RC20GF432J; 4300 ohms + 5%; 1/2 watt; Spec MIL-R-11A	Plate transient suppressor
W-303.1***	Assemble from component parts	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: RF unit to chassis servicing interconnection; RAQA Dwg. No. VW-0885; AN type CX- 3154/U; component parts same as W-303.	
XV-604.1***	N16-S99999-0635	SOCKET, ELECTRON TUBE: 9 contact lock in type; medium; 2-1/8 in. dia by 15/16 in. high overall; eight mtg holes .132 in. dia on 1.906 in. dia circle; copper alloy silver plated contacts; modified Eimac No. 990-4S; RAQA Dwg. No. VG-2877; special air flow type socket for V604, V605 and V606	Socket for Tube V604
XV605.1***		Same as XV604.1	Socket for Tube V605
XV606.1***		Same as XV604.1	Socket for Tube V606

*** Used on Transmitter T-336B/URT-7

TABLE 8—2. TABLE OF REPLACEABLE PARTS

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TRANSMITTING SET, RADIO AN/URT-7	
A401	N17-C-77417-3587	CONTACT, case: #32 (B & S) heat treated beryllium copper, silver pl; 4¾″ lg x 11/16″ wd x 11/32″ h o/a; mtd by five 0.096″ diam holes spaced 1-1/16″ apart starting ¼″ from one end; seventeen 1/32″ wd sawcuts spaced ¼″ c to c along one side; same side bent to angle of 30° and outer edge rolled to semi-cylinder, on ⅛″ radius; FTRC dwg FRB-24718-1, part no. A1002974	Grounds Top of RF Unit to Power Supply Chassis
A402	N17-C-77413-2201	CONTACT, case: 0.010″ thk heat treated beryllium copper, silver pl; 2″ lg x 1-1/16″ wd x 9/16″ h o/a; mtd by two 0.169″ diam holes spaced 0.687″ c to c; 3 equally spaced 1/64″ wd slits each end; bent to form irregular profile; FTRC dwg FRB-25435-1, part no. A1002779	Grounds Side of RF Unit to Power Supply Chassis
A403-1 to A403-4	*N17-P-70009-4001	POST, supporting: non-shock; cad pl brass; ¾″ lg hex rod with #8-32 x 7/32″ lg thd one end, #8-32 thd x ⅜″ d axial hole other end, and 0.015″ wd x root diam thd-relief undercut at base of thd section; mtd by male end; FTRC dwg FRB-21845-1, part no. A1003103A	Fastening for Terminal Housing
A501	*N17-G-157386-516	GASKET: term housing cover; black synthetic rubber, 35-45 Shore durometer hardness; 1 locating hole 6¼″ x 7⅞″; rectangular; 8⅞″ lg x 7¼″ wd x 1/32″ thk o/a; FTRC dwg FRB-28046-2, part no. B1003876	Terminal Housing Cover
A502-1 to A502-4	N16-S-854061-102	SUPPORT, leg: for radio transmitter; dead soft steel; cad pl; 3″ lg x 3″ wd x 1½″ h o/a; four 0.272″ diam mtg holes on 2½″ x 2½″ mtg ctr; one 11/16″ diam hole in ctr; FTRC dwg FRB-28007-2-2, part no. B1003914-2	Transmitter Cabinet Support
A601-1 to A601-4	N17-C-77409-5001	CONTACT, case: #32 (B & S) spring temper phosphor bronze, silver pl; 1⅛″ lg x 17/32″ wd x 5/32″ h o/a; mtd by two 0.128″ diam holes on 0.625″ mtg ctrs; one side bent at 45° angle, to 3/16″ from edge, with five equally spaced cuts 1/64″ wd x 3/16″ d from same edge; FTRC dwg FRB-27079-1, part no. A1001-176	Grounds Plate Tank Compartment to Chassis (Vertical; 2 Sides, Front and Rear)
A602	N17-C-77417-8006	CONTACT, case: #32 (B & S) ga phosphor-bronze, spring temper, silver pl; 7-13/16″ lg x ⅞″ wd x ⅛″ h o/a; mtd by four 7/16″ diam and ten 0.096″ diam holes, unequally spaced; one side bent at 45° angle to ⅛″ from edge, with 39 cuts 1/64″ wd x ⅛″ d from edge x 3/16″ c to c; FTRC dwg FRB-27081-2-1, part no. B1000903-1	Grounds Side-Shield to Plate Tank Compartment (Horizontal; Lower Right Side)
A603	N17-C-77417-8008	Same as A602, except edge bent 45° in opposite direction; FTRC dwg FRB-27081-2-2, part no. B1000903-2	Grounds Side-Shield to Plate Tank Compartment (Horizontal; Lower Left Side)

A604	N17-C-77417-8001	CONTACT, case: #32 (B & S) ga phosphor-bronze, spring temper, silver pl; 7-23/32″ lg x ¾″ wd x 3/32″ h; mtd by four 7/16″ and twelve 0.096″ diam holes unequally spaced; outer side bent at 45° to 9/32″ from edge, with 35 slots 1/32″ wd x 9/32″ d from same edge x 7/32″ c to c starting 13/64″ from one end; FTRC dwg FRB-24711-1-1, part no. A1001289-1	Grounds Side-Shield to Plate Tank Compartment (Horizontal; Upper Right Side)
A605	N17-C-77417-8003	CONTACT, case: #32 (B & S) ga phosphor-bronze spring temper, silver pl; 7-23/32″ lg x ¾″ wd x 0.008″ thk; mtd by four 7/16″ and twelve 0.096″ diam holes unequally spaced; same as A604, except 45° bend is in opposite direction; FTRC dwg FRB-24711-1-2, part no. A1001289-2	Grounds Side-Shield to Plate Tank Compartment (Horizontal; Upper Left Side)
A606	*N17-C-965001-240	CUSHION, shock pad: rectangular; 3-3/16″ lg x 2⅞″ wd x ¼″ thk; black neoprene rubber plates; twelve 9/32″ diam holes drilled thru major surfaces; FTRC dwg FRR-23453-1, part no. A1001171-2	Mtg for Blower B601
B601†	N17-B-21188-4050	BLOWER, centrifugal vane: electric motor operated; 2½″ diam rotor on SS shaft; non-portable; guarded; motor: 115 v, 1.4 amp, 1 ph, 50/60 cps, 1/10 hp at 8000 rpm: 40°C cont duty temp rise; 8-9/16″ lg x 4-7/32″ h x 3-29/32″ d, o/a; 145 cfm at 8000 rpm, 107 cfm at 8950 rpm and 2″ back pressure; 1 speed; direct drive; counterclockwise rotation (from motor side); bottom horizontal discharge; molded bakelite blower housing; mtd by 4 tapped (#10-32 thd) holes on 0.812″ and 1.375″ ctr in pad on motor casting; RF gnd brush on shaft; CMBX model D, type US-2503; FTRC dwg FRE-24312-12, part no. C1001484	Transmitter Cooling
B601†	17B-21188-4040	BLOWER, centrifugal vane: electric motor operated; 2½″ diam rotor on SS shaft; non-portable; guarded; motor: 115 v, 1.2 amp, 1 ph, 50/60 cps, 120 w, 7300 rpm (full load), 1/10 hp at 8000 rpm; 40° C cont duty temp rise; 8-9/16″ lg x 4-7/32″ h x 3-29/32″ d, o/a; 145 cfm at 8000 rpm, 107 cfm at 8950 rpm and 2″ backpressure; 1 speed; direct drive; clockwise rotation (from load side); bottom horizontal discharge; molded bakelite blower housing; mtd by 4 tapped (#10-32 thd) holes on 0.812″ and 1.375″ ctrs in pad on motor casting; RF gnd brush on shaft; CASN model 715-1, serial no. 62022; FTRC part no. C1001484	Transmitter Cooling
C101	N16-C-49221-9883	CAPACITOR, fixed: paper; 2 uf +20%, −10%; JAN type CP53B1EF205V; 600 vdcw; spec JAN-C-25	Relay K101 Bypass
C102	N16-C-41627-6350	CAPACITOR, fixed: paper; 6000 uuf ±20%; JAN type CP20A3EF602M; 600 vdcw; spec JAN-C-25	Speech Amplr Coupling
C103		Same as C102	Modulation Indicator Coupling
C104	N16-C-54460-4481	CAPACITOR, fixed: paper; 3 sect; 100,000 uuf ±20%, −10%, each sect; JAN type CP53B5EF104V; 600 vdcw; 1 term ea sect gnd; spec JAN-C-25	(See C104A, C104B and C104C)
C104A		Part of C104	AVC Filter
C104B		Part of C104	AVC Filter

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.
†Supplied alternatively.

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIG-NATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C104C		Part of C104	Speech Amplr Screen Bypass
C105		Same as C102	AVC Amplr Coupling
C106	N16-C-32435-6608	CAPACITOR, fixed: mica; JAN type CM35B392K; 3900 uuf ±10%; 500 vdcw; spec JAN-C-5	Filter Amplr Coupling
C107		Same as C102	AVC Rect Coupling
C108	N16-C-44287-7140	CAPACITOR, fixed: paper; JAN type CP26A1EF503M; 50,000 uuf ±20%; 600 vdcw; no int gnd; spec JAN-C-25	Clipper Coupling
C109		Same as C102	Filter Amplr Coupling
C110		Not used	
C111		Same as C110	Driver Amplr Cathode Bypass
C112		Same as C102	Driver Amplr Coupling
C113		Same as C110	Modulator Bias Filter
C114	N16-C-31095-6644	CAPACITOR, fixed: mica; JAN type CM30B102M; 1000 uuf ±20%; 500 vdcw; spec JAN-C-5	Modulator Grid Bypass
C115		Same as C114	Modulator Grid Bypass
C116	N16-C-32651-9288	CAPACITOR, fixed: mica; JAN type CM35B472M; 4700 uuf ±20%; 500 vdcw; spec JAN-C-5	Modulator Screen Bypass
C117		Same as C108	Multivibrator Coupling
C118		Same as C108	Vol Expander Diode Coupling
C119		Not used	
C120	N16-C-45807-8094	CAPACITOR, fixed: paper; JAN type CP26A1EF104M; 100,000 uuf ±20%; 600 vdcw; no int gnd; spec JAN-C-25	MCW Oscillator Cathode Bypass
C121	N16-C-17586-4575	CAPACITOR, fixed: ceramic; JAN type CC36 RK181J; 180 uuf ±5%; 500 vdcw; spec JAN-C-20	MCW Oscillator Feedback

C122		Same as C121	MCW Oscillator Feedback
C123		Same as C121	MCW Oscillator Feedback
C124	N16-C-64232-8500	CAPACITOR, variable: ceramic; JAN type CV12D121; rotary type, 1 sect; 20 to 125 uuf; 500 vdcw; spec JAN-C-81	MCW Oscillator Freq Adjustment
C125		Same as C102	MCW Driver Coupling
C126	N16-C-48810-4190	CAPACITOR, fixed: paper; JAN type CP53B1EC105K; 1.0 uf ±10%; 200 vdcw; no int gnd; spec JAN-C-25	MCW Carrier Hold
C127		Same as C101	High Voltage Supply Filter
C128		Same as C110	Relay K101 Bypass
C129	N16-C-17086-5795	CAPACITOR, fixed: ceramic; JAN type CC26UJ101K; 100 uuf ±10%; 500 vdcw; spec JAN-C-20	MCW Oscillator Feedback
C130		Same as C114	Audio Input Line Bypass
C131		Same as C114	Receiver Line Bypass
C132		Same as C114	Receiver Line Bypass
C133		Same as C114	Audio Input Line Bypass
C401*	N16-C-51861-2442	CAPACITOR, fixed: paper; Navy type -482263-10; 10 uf ±10%; 1000 vdcw; no int gnd; CD type #10100-J1, FTRC part no. B1003248	300-volt Supply Filter
C402		Same as C401	525-volt Supply Filter
C403		Same as C401	525-volt Supply Filter
C404	N16-C-20931-7851	CAPACITOR, fixed: electrolytic; JAN type CE41C122F; 1200 uf, –10%, +150%; 25 vdcw; no int gnd; spec JAN-C-62	12-volt Supply Filter
C405		Same as C404	12-volt Supply Filter
C406	N16-C-20461-8100	CAPACITOR, fixed: electrolytic; JAN type CE41C201H; 200 uf, –10%, +150%; 100 vdcw; no int gnd; spec JAN-C-62	42-volt Supply Filter
C407		Same as C406	42-volt Supply Filter
C408	N16-C-49981-9560	CAPACITOR, fixed: paper; JAN type CP53B1EB405V; 4 uf +20%, –10%; 100 vdcw; no int gnd; spec JAN-C-25	Audio Line DC Blocking

*Physical size of this item is critical. Use exact size for replacement.

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C409		Same as C408	Audio Line DC Blocking
C410	N16-C-47297-3180	CAPACITOR, fixed: paper; JAN type CP54B1EF504K; 500,000 uuf ±10%; 600 vdcw; no int gnd; spec JAN-C-25	525-volt Supply Filter
C411		Same as C101	190-volt Supply Filter
C412	N16-C-54535-8175	CAPACITOR, fixed: paper; 3 sect, each 250,000 uuf +20% −10%, 400 vdcw; HS metal can; 1-13/16" lg x 1½" h x 29/32" wd o/a excl term and mtg ears; impr and filled w/"Hyvol D" (castor oil); three 11/16" lg solder lug term ½" c to c on bottom; 1 term ea sect gnd to case; mtd by two 3/16" diam holes, 2⅛" c to c, in ears flush w/bottom at ends of case; CAW #430-AB per FTRC dwg F-19749-1-2, part no. A1002814-2	525-volt Filter
C601	N16-C-18653-9200	CAPACITOR, fixed: ceramic dielectric; 1000 uuf ±20%; temp coef variable; 500 vdcw; CER type #319, FTRC part no. 620014	R-F Oscillator Plate Bypass
C602	N16-C-18692-1100	CAPACITOR, fixed: ceramic dielectric; 1200 uuf ±10%; temp coef variable; 500 vdcw; CER type #GP2B, FTRC part no. 620259	R-F Oscillator Plate Coupling
C603	N16-C-16254-5400	CAPACITOR, fixed: ceramic; JAN type CC21UJ270K; 27 uuf ±10%; 500 vdcw; spec JAN-C-20	R-F Oscillator Output Coupling
C604	N16-C-58139-1980	CAPACITOR, variable: air dielectric; plate meshing type, 1 sect; 1.75 to 8.69 uuf; SLC characteristic; 750 v RMS test; ceramic insulation; FTRC dwg FRE-24660-1-1, part no. A1001026-1	R-F Oscillator Plate Padding
C605	N16-C-63465-8921	CAPACITOR, variable: air dielectric; plate meshing type; 4 sect; sect #1 (C605A) 8-93 uuf, sect #2 (C605B) 9.3-100 uuf, sect #3 (C605C) 9.8-112 uuf, sect #4 (C605D) 5.9-65.3 uuf; MLF characteristic; 1000 v RMS test; 7-7/16" lg x 3-3/16" wd x 2-5/16" d o/a; extension shaft; 48 brass plates w/copper flash + nickel pl + silver pl; clockwise to increase capacity; Mycalex ins; solder lugs on stator, rotor gnd; tapped holes in frame of assem for mtg on chassis; has provision for mtg capacitors C604, C611, C616, C621 and inductors L602, L604, L607, L609, L610; circuit symbols for same stamped adjacent; lubricated w/ Molykote dry lubricant; FTRC dwg FRA-23403-14, part no. A1000977-2	Driver Tuning
C605A		Part of C605	R-F Oscillator Plate Tuning
C605B		Part of C605	Doubler Plate Tuning
C605C		Part of C605	R-F Amplr Plate Tuning

C605D		Part of C605	Tripler Plate Tuning
C605E	N17-I-64286-9001	INSULATOR, plate: rectangular; glass bonded mica, grade L-5, per JAN-I-10; 1¾" wd x 3/16" thk o/a; three 0.106" diam mtg holes ctb 7/32" diam x 1/16" d: one located 3/16" from end of plate on ctr line, other two spaced 7/32" each side of ctr line on a line perpendicular to ctr line and 1⅜" from first hole; also two 0.154" diam holes centered ⅜" apart on ctr line; FTRC dwg FRG-23377-1, part no. A1000966	Stator Mtg for Capacitor C605
C606	N16-C-16093-3200	CAPACITOR, fixed: ceramic; JAN type CC21SH200K; 20 uuf ±10%; 500 vdcw; spec JAN-C-20	R-F Oscillator Neutralizing
C607		Same as C601	Doubler Grid Bypass
C608		Same as C601	Doubler Plate Bypass
C609		Same as C602	Doubler Plate Coupling
C610	N16-C-16799-4750	CAPACITOR, fixed: ceramic dielectric; 68 uuf ±10%; temp coef variable; 500 vdcw; CER type GP1K, part no. 620254	Doubler Output Coupling
C611	N16-C-58445-6331	CAPACITOR, variable: air dielectric; plate meshing type, 1 sect; 2.15 to 14.58 uuf; SLC characteristic; 750 v RMS test; ceramic insulation; FTRC dwg FRE-24660-1-2, part no. A1001026-2	Doubler Plate Padding
C612		Same as C601	R-F Amplr Cathode Bypass
C613		Same as C601	R-F Amplr Plate Bypass
C614		Same as C602	R-F Amplr Plate Coupling
C615	N16-C-16253-7100	CAPACITOR, fixed: ceramic; JAN type CC21SL270K; 27 uuf ±10%; 500 vdcw; spec JAN-C-20	R-F Amplr Output Coupling
C616		Same as C611	R-P Amplr Plate Padding
C617		Same as C601	Tripler Grid Bypass
C618	16-C-18660-1582	CAPACITOR, fixed: ceramic dielectric; 1000 uuf ±20%; temp coef variable; 1600 vdcw, CBN DA-720	Tripler Plate Bypass
C619	N16-C-30698-5321	CAPACITOR, fixed: mica dielectric; 800 uuf ±20%; temp coef not specified; 300 vdcw; FTRC dwg FRE-24314-2, part no. A1001117-2	Tripler Screen Bypass
C619A	N17-I-64046-1240	INSULATOR, plate: dielectric plate for screen bypass capacitor u/w electron tube type 4X150A (V604); ruby mica sheet; 2½" lg x 2½" wd x 0.002" thk; mtd by four 0.169" diam holes on 1.750" x 1.750" mtg/c; single 1" diam hole in ctr; FTRC dwg FRB-23451-1-1, part no. 1001119-1	p/o C619

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIG-NATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C619B	N17-I-64046-1245	Same as C619A, except 1⅝" diam central hole; FTRC dwg FRB-2345-1-2, part no. A1001119-2	p/o C619
C619C	N17-C-79659-5001	CONTACT, electron tube: contact plate for electron tube type 4X150-A (V604); heat treated beryllium copper, silver pl; 2¼" lg x 2¼" wd x 5/16" h o/a; four 5/16" diam holes on 1.75" x 1.75" mtg/c; 1-3/16" diam hole in ctr with 8 spring contact fingers, 45° apart; FTRC dwg FRB-23450-2, part no. B1001120	p/o C619
C620		Same as C602	Tripler Plate Coupling
C621		Same as C611	Tripler Plate Padding
C622	16-C-18659-7772	CAPACITOR, fixed: ceramic dielectric; 1000 uuf ±20%; temp coef variable; 500 vdcw; feed thru "Ceramicon", incl mtg nut, CER-327	R-F Driver Filament Bypass
C623		Same as C622	PA Filament Bypass
C624		Same as C622	Tripler Grid Return Bypass
C625		Same as C618	Tripler Plate Supply Bypass
C626		Same as C622	PA Screen Supply Bypass
C627		Same as C622	Doubler Grid Meter Bypass
C628		Same as C622	Pwr Output Ind Bypass
C629		Same as C622	PA Grid Return Return Bypass
C630		Same as C622	Keyed 300-volt Supply Bypass
C631		Same as C618	PA Plate Supply Bypass
C632		Same as C622	300-volt Supply Bypass
C633		Same as C622	PA Filament Bypass
C634		Same as C622	PA Screen Supply Bypass
C635		Same as C622	PA Grid Return

C636		Same as C618	PA Plate Supply Bypass
C637	N16-C-63457-9641	CAPACITOR, variable: air dielectric; plate meshing type; 4 sect; sect #1 and #2 connected for split-stator operation, and 9.1 to 58 uuf stator-to-stator; sect #3 and #4 connected for split-stator operation and 8.0 to 22.5 uuf stator-to-stator; trimmer between sect #3 and #4 0-1 uuf; SLC characteristic; 1000 v RMS test; 7⅝″ lg x 2¾″ h x 5″ d o/a; exended shaft; 38 plates, brass w/ copper flash + nickel + silver pl; 180° clockwise rotation to decrease capacity; Mycalex ins; screw terms on stator, rotor ins for sects #1 and #2 and grounded for sect #3 and #4; mtd on chassis by tapped holes in framework of assem; has provisions for mtg capacitors C639 and C640, resistor R614 and inductors L613, L614; circuit symbols stamped adjacent; lubricated with Molykote dry lubricant; FTRC dwg FRA-23115-14, part no. A1000744-2 (less marking)	PA Grid Tuning
C637A			PA Grid Tuning
C637B		Part of C637	Output Filter Tuning
C637C		Part of C637	Output Filter Trimmer
C637D	N16-R-94402-1530	ROTOR, capacitor: air dielectric; c/o 3-sec metal shaft with 16 plates for MLF tuning characteristic on ctr section; copper flash + nickel pl + silver pl; sect separated by ins; 7-5/32″ lg x 1½″ wd x 1¼″ h o/a; FTRC dwg FRB-23930-3, part no. A1000760	Rotor for Capacitor Sections C637A, C637B, C637C
C637E	N17-I-67024-2401	INSULATOR, plate: rectangular with 1⅛″ lg x ¼″ wd x 5/32″ d rabbets along longer edges of one face; glass bonded mica, grade L-5, per spec JAN-I-10; 1⅛″ lg x 1″ wd x 7/32″ thk o/a; four 0.106″ diam mtg holes located on ¾″ x 13/16″ mtg ctr; also two 0.106″ holes ctb 7/32″ diam x ⅛″ d and centered 7/16″ apart on longer ctr line of unrabbeted face; FTRC dwg FRP-23017-1, part no. A1000758	Trimmer Mtg for PA Grid Section of C637
C637F	N17-I-64287-6651	INSULATOR, plate: rectangular; glass bonded mica, grade L-5, per spec JAN-I-10, 2″ lg x ¾″ wd x 3/16″ thk o/a; four 0.106″ diam mtg holes ctb 7/32″ diam x 1/16″ d on 1⅝″ x ⅜″ mtg ctr, also, two 0.169″ diam holes centered ⅜″ apart on longer ctr line; FTRC dwg FRG-23015-1, part no. A1000750	Stator Mtg for PA Grid Section of Capacitor C637
C637G	N16-M-61036-1051	MOUNTING, capacitor: glass bonded mica, grade L-3, per spec JAN-I-10; rectangular; 1½″ lg x ⅜″ wd x 0.344″ h o/a; four holes spaced 3/16″, 9/16″, 15/16″ and 1-5/16″ from one end along longer ctr line of top face; two end holes 0.106″ diam and ctb 7/32″ diam x 5/32″ d from top surface; two central holes 0.169″ diam; FTRC dwg FRP-23226-1, part no. A1000805	Mtg for Output Filter Section of Capacitor C637
C638	N16-C-62067-7300	CAPACITOR, variable: air dielectric; plate meshing type, 2 sect, connected for split stator operation, each sec 2.3-8.0 uuf SLC characteristic; 750 v RMS test; ceramic insulation, CEJ#9MB11 with locking bearing FTRC part no. 674022	PA Grid Trimmer

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C639		Same as C622	PA Filament Bypass
C640		Same as C622	PA Grid Return Bypass
C641		Same as C618	PA Plate Supply Bypass
C642	N16-C-55679-6288	CAPACITOR, fixed: Teflon dielectric; 700 uuf ±20%; 500 vdcw; no specified temp coef; FTRC dwg FRE-24315-2, part no. A1000909	PA Screen Bypass
C642A	N17-I-64841-9841	INSULATOR, plate; dielectric plate for screen bypass capacitor, u/w electron tube type 4X150A (V605 & V606); Teflon dielectric; non-std shape 4⅝" lg x 3-5/16" wd x 0.010" thk o/a; mtd by six 0.128" diam holes; 2 on ctr line, one 1.250 each side of ctr line; two 1" diam holes centered 1.250" each side of ctr line on line perpendicular to it; FTRC dwg FRP-23327-2-1, part no. B1000911-1	p/o C642
C642B	N17-I-64841-9846	INSULATOR, plate: same as C642A, except 1⅝" diam vs 1" diam holes for tubes; FTRC dwg FRP-23327-2-2, part no. B1000911-2	p/o C642
C642C	N17-C-79663-9001	CONTACT, electron tube: cont plate for pair of type 4X150A electron tubes; two 1-3/16" diam holes ea with 8 cont fingers on inner circumference; 0.010" thk heat treated beryllium copper, silver pl; 4½" lg x 3-3/16" wd x ¾" h o/a; mtd by six 0.250" diam holes; 2 on ctr line, one 1.25" each side of ctr line and one 1.625" each side of ctr line; FTRC dwg FRB-23330-3, part no. L1000912	p/o C642
C643		Same as C622	Output Indicator Bypass
C644		Same as C622	Output Indicator Bypass
C645	16-T-98076-2401	TUNER, RF: PA plate tuning c/o 4 section var air capacitor and two #F inductances (shorted transmission lines) to form tuned circuit w/115-156 mc oper freq, 1 solder lug term, 2 pressure band anode connections for type 4X150A tubes; 7½" lg x 4½" wd x 2¼" h; seven #8-32 thd tapped mtg holes irregularly spaced; Fed Tele & Rad dwg C1002248, part no. A1000698-3	PA Plate Tuning
C645A	16-R-94402-1489	ROTOR, capacitor: for plate meshing type; 2 sections; 2 plates per section brass shaft, brass plates; copper flash, silver over nickel pl; 5-23/32" lg x 1-5/16" wd x 2-7/32" h; ¼" shaft Fed Tele Rad dwg #B1001239	p/o C645
C646	*N16-P-401281-166	PLATE, capacitor: air neutralizing; c/o 1½" lg #14 (B & S) ga copper wire w/"FORMVAR" ins and 1¼" lg #18 type 649 grade B1 sleeving; 0.5 to 5 uuf; one solder lug term, term mtd, adj by varying position of capacitor; 1½" lg x 7/64" wd x 21/32" h; Fed Tele & Rad dwg #A1001389, part no. A1001390-1	PA Neutralizing
C647		Same as C646	PA Neutralizing

CR401	N17-R-51053-8320	RECTIFIER, metallic; single stack, selenium; full wave bridge; AC input 26 v max; DC output; new 20.5, aged 19 v, 1.8 amp resistive or inductive load; cont duty, 1 phase; 35° C ambient oper temp with normal convection cooling; CFT #FTR-104B1SCLY2	12-volt Rectifier for Indicator Lamps and microphone current for remote control
CR402	N17-R-51277-2831	RECTIFIER, metallic; single stack, selenium; full wave bridge; AC input 104 v max; DC output, new 82 v, aged 77 v, 0.45 amp resistive or inductive load; cont duty, 1 phase; 35° C ambient oper temp with normal convection cooling; CFT FTR-103B4SCLY1	42-volt Rectifier for Bias, Microphone and Relay Voltages
CR601	N16-T-51721-10	CRYSTAL UNIT, rectifying: JAN type 1N21B; spec JAN-1A	Output Indicator Rectifier
E101-1 to E101-2	N16-S-34520-3864	SHIELD, tube: JAN type TS102U01, nickel pl brass; cylindrical; 0.838″ wd x x 0.930″ lg x 0.810″ min ID x 1⅜″ h o/a, with ½″ diam hole in top; bayonet mtg; ⅜″ min ID non-magnetic conical spring inside; spec JAN-S-28A	Shielding for Type 6AL5 Tubes (V103 and V108)
E102-1 to E102-2	N16-S-34557-8351	SHIELD, tube: JAN type TS102U02; nickel pl brass; cylindrical; 0.838″ wd x 0.930″ lg lg x 0.810″ min ID x 1¾″ h o/a, with ½″ diam hole in top; bayonet mtg; ⅜″ min ID non-magnetic conical spring inside; spec JAN-S-28A	Shielding for Type 6BA6 (V101) and 6AT6 (V109) Tubes
E103-1 to E103-4	N16-S-34576-6514	SHIELD, electron tube: JAN type TS103U02; CRS; round open top; "J" slotted for bayonet mtg; 1-15/16″ lg x 0.950″ ID; with internal spring; spec JAN-S-28A	Shielding for Type 12AU7 Tubes (V102, V104, V107, V110)
E104-1 to E104-2	N16-D-46337-9487	DIAL, disc type; c/o ⅝″ diam bronze knob and 1⅛″ diam nickel silver (#20 B & S ga) dial; dial calibrated over over 300° of arc with short radial lines spaced 15° apart at circumference, with alternate lines (30° spacing) numbered "0" thru "10" counterclockwise; 9/16″ lg x 1⅛″ OD; for 0.251″ diam shaft; mtd on shaft by two #6-32 thd x 3/16″ lg, Allen type headless steel cup point setscrews, 120° apart in knob, with RH screw aligned with numeral "7"; knob copper plated, 40 turns per inch straight knurl; dial dull satin finish, lacquer dipped; dial characters etched and filled w/black enamel; FTRC dwg FRA-23141-2-2, part no. A1001455-2	Controls for Potentiometers R101 and R115
E105	N16-D-46337-9483	DIAL: same as E104, except (1) dial has a single radial index line ⅛″ lg from edge and (2) RH setscrew is 90° to left of index line; FTRC dwg FRA-23141-2-6, part no. A1001455-6	Control for Switch S101
E106		Not used	
E107-1 to E107-2	N17-C-800487-701	CLIP: electron tube; for ⅜″ diam tube cap; cad pl (0.0005″) brass, ⅞″ lg x ⅜″ wd x 0.195″ h one soldering lip; CNA type #24, FTRC part no. 388003	Plate Cap for Type 807 Tubes (V105, V106)
E108	*N17-B-78114-7769	TERMINAL BOARD: 2⅛″ wd x 5″ lg sheet 3/32″ thk natural glass cloth lam thermosetting plastic, type GMG, per spec JAN-P-13; 9 pairs brass stud type term located on vert lines spaced ⅜″ apart starting 25/32″ from right end of board with one term of each pair on line 5/32″ above bottom long edge and other term spaced 1-13/16″ above these on vert lines, except pairs #5 and	Support for Capacitors C103, C118 and C120 and Resistors R125, R128, R132, R144, R149 and R150

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
E108 (Cont)		#6 spaced 29/32″ apart; overall dimen 2⅛″ wd x 5″ lg x 19/32″ d incl term but excl bracket for C120; mtd by four 0.136″ diam (#29 drill) holes located on 1-13/16″ x 4-11/16″ ctr with one of holes 5/32″ from top and right edges; two 0.221 (#2 drill) holes, one located 3-15/16″ from right end on ctr line and one 9/32″ below top edge and 2-3/32″ from right end; stamped with circuit symbols of capacitors and resistors, in 3/32″ h characters, and lacquered; FTRC dwg FRA-21738-2, part no. A1002238 (less capacitors, resistors, wiring and bracket)	
E109	*N17-B-78207-3069	TERMINAL BOARD: 2⅛″ wd x 5⅜″ lg sheet 3/32″ thk natural glass cloth lam thermosetting plastic type GMG, per spec JAN-P-13; 11 pairs brass stud type term located on vert lines spaced ⅜″ apart starting 21/32″ from left end of board, with one term of each pair on line 5/32″ below top long edge and other term spaced 1-13/16″ below these on vert lines, except pair #3 spaced 1-3/32″ apart and pairs #4, #5 and #9, 29/32″ apart; also 3 like term centered 29/32″ apart on vert line 5/32″ from right edge; overall dimen 2⅛″ wd x 5-1/16″ lg x ½″ d o/a incl term, but not bracket for C108; mtd by four 0.1695″ (#18 drill) diam holes located on 29/32″ x 4-9/16″ ctr with with one of holes 5/32″ from left and top edges; one 0.221″ (#2 drill) hole located ⅜″ from bottom edge and 1-13/32″ from left edge, and one 0.101 (#38 drill) diam hole located ½″ from bottom edge and 4-2332″ from left edge; stamped with circuit symbols of capacitors and resistors in 3/32″ h characters and lacquered; FTRC dwg FRA-21740-2, part no. A1002349 (less resistors, capacitors, wiring and bracket)	Support for Capacitors C105-C109 and C112 and Resistors R104, R108, R109, R114, R116, R143, R147 and R148
E110	*N17-B-78188-5969	TERMINAL BOARD: 2⅛″ wd x 5⅜″ lg sheet 3/32″ thk natural glass cloth lam thermosetting plastic type GMG, per spec JAN-P-13; 10 pairs brass stud type term located on vert lines spaced ⅜″ apart starting 1-9/32″ from left end of board with one term of each pair on line 5/32″ below top long edge and other term spaced 1-13/16″ below these on vert lines, except left pair spaced 29/32″ apart; also 3 like term centered 29/32″ apart on vert line 5/32″ from left end, and 3 others located 2-13/32″ and 4-21/32″ from left end; on long ctr line; overall dimen 2⅛″ wd x 5⅜″ lg x ½″ d o/a; incl term but not bracket for C117; mtd by four 0.1695″ (#18 drill) holes located on 29/32″ x 4-9/16″ ctr with one of holes located 5/32″ from top and right edges; stamped with circuit symbols of capacitors and resistors, in 3/32″ h characters, and lacquered; FTRC dwg FRA-21745-2, part no. A1002350 (less resistors, capacitors wiring and bracket)	Support for Capacitors C117, C125, C121 – C123, and Resistors R105, R122, R124, R126, R127, R129, R130 and R124 – R138
E111	*N17-B-78035-5169	TERMINAL BOARD: 1¼″ wd x 3-9/16″ lg sheet 3/32″ thk natural glass cloth lam plastic, type GMG, per spec JAN-P-13; 7 pairs brass stud type term, pairs centered 15/16″ apart on vert lines parallel to, and 5/32″, 17/32″, 1-13/32″, 1-25/32″, 2-5/32″, 3-1/32″ and 3-13/32″ from one end; overall dimen 1⅜″ h x 3-9/16″ lg x 1″ d o/a incl term and brackets; stamped with circuit symbols of resistors in 3/32″ h characters, and lacquered; also two 0.189″ (#12 drill)	Support for Resistors R102, R106, R107, R110, R111, R112, R123, R133, R139 and R140

		diam wiring holes 1-13/32″ and 2-5/32″ from same end on long ctr line; mtd by two 90° metal brackets each with single 0.154″ diam (#23 drill) hole, holes spaced 1⅝″ c to c; FTRC dwg FRA-21747-2 part no. A1002351 (less resistors and wiring)	
E401	N17-C-67443-6230	CONNECTOR, adapter: AN type UG-306/U; male one end, female other end; 1 round male cont, 1 round female cont; 90° angle; 500 volts: 52 ohms RF impedance; freq-impedance characteristic constant; Navy spec RE49F429	RF Adapter
E402		Same as E105	Control for Switch S401
E403	*N17-B-78084-7790	TERMINAL BOARD: 2″ wd x 5″ lg sheet 3/32″ thk natural glass cloth lam thermosetting plastic, type GMG, per spec JAN-P-13; 5 pairs brass stud type term, pairs centered 1¼″ apart on vert lines parallel to, and 2-13/16″, 3-3/16″, 3-9/16″, 3-15/16″ and 4-5/16″ from right end; also 3 pairs like term centered 1⅝″ apart, ¾″ apart and ¾″ apart on vert lines 2⅜″, 1⅜″ and ¼″ respectively, from right end, overall dimen 2″ wd x 5″ lg x 19/32″ d o/a; mtd by four 0.1695″ diam (#18 drill) holes located on 1⅝″ x 4⅛″ ctr with one of holes 3/16″ from left and top edges; stamped with circuit symbols of resistors in 3/32″ h characters, and lacquered; FTRC dwg FRA-22784-2, part no. A1002720 (less resistors)	Support for Resistors R401, R406, R415 and R416
E404-1 to E404-2	N17-I-48679-2401	INSULATOR, feed-thru: male section: c/o neck portion plus conical collar: JAN type NS3W4101; grade III white glazed ceramic; ⅝″ lg x ½″ OD x 0.143″ ID o/a; neck 15/64″ OD x ¼″ lg; collar tapers ½″ to ⅜″ toward end; spec JAN-I-8	HV Rectifier Plate Lead
E405-1 to E405-2	N17-I-47363-4201	INSULATOR, feed-thru: JAN type NS3W4201; female section: conical shape; grade III white glazed cramic; ⅜″ lg x ½″ max OD x ⅜″ min OD x 0.143″ ID with ¼″ d axial recess in large end; spec JAN-I-8	HV Rectifier Plate Lead
E406	N17-I-69173-7101	INSULATOR, stand-off: cylindrical; JAN type NS3W0205 grade III white glazed ceramic; ⅝″ lg x ½″ diam with #8-32 thd x 3/16″ d axial hole each end; spec JAN-I-8	Supports for C410 and C412
E407		Same as E104	Control for R411
E408	N16-D-46337-9485	DIAL: same as E104, except (1) dial has single radial index line ⅛″ lg from edge and (2) RH setscrew is in line with index line; FTRC dwg FRA-23141-2-8, part no. A1001455-8	Control for LOCAL-REMOTE Switch S404
E501	N17-B-77936-5240	BOARD, terminal: general purpose; 10 solder term and brass nickel pl binder head screws; term ⅜″ c to c with barriers; molded bakelite 4⅜″ lg x ⅞″ wd x 13/32″ thk o/a; four 0.160″ diam mtg holes on 4⅛″ and 5/16″ ctr; CJC type 10-140-Y.	External Connections
E502		Same as E501	External Connections

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
E503	N17-S-50972-6851	SUPPRESSOR, electrical noise: Navy type -53183; capacitor and coil type; 5″ lg x 1-11/32″ h x 3″ wd o/a: 550 v DC, 250 v AC, 5 amp 60 cps; attenuation range 150 kc to 150 mc; rectangular metal case; mtd by external clamp; 4 solder lug term	Power Line Noise Filter
E601	N17-S-50963-2625	SUPPRESSOR, electrical noise: capacitor and iron core coil type; c/o two 2.5 uf capacitors and one 600 uh coil; 3½″ lg x 3⅝″ wd x 1″ h o/a; 2¾″ lg x 2⅜″ wd x 1″ h less term and brackets; 1.5 amp, 115 v AC rating; rectangular metal case; mtd by one 0.169″ diam hole in each of 3 tight angle mtg brackets; 2 mtg holes centered 3-3/16″ c to c on longer ctr line of mtg face; third hole (in inverted bracket) centered ½″ from end of case on line parallel to, and 1-17/32″ from longer ctr line, in plane ⅜″ above mtg face; 2 solder lug term on each side of case, each pair spaced ⅝″ c to c; Tobe-Deutchmann CTD "Filteretts" #1396-1; FTRC dwg FRE-28713-1 part no. A1001757	Blower Motor Noise Filter
E602		Same as E406	Supports for C647
E603-1 to E603-3	†N16-S-34576-6521	SHIELD, electron tube: CRS; round open top; slotted for bayonet mtg; 1-15/16″ lg x 0.950″ ID; with internal spring; 2 cut-outs at bottom, 180° apart (cuts made at intersection of cyl of shield with cyl of ¾″ diam having its axis in plane of bottom of shield and perpendicular to axis of shield); CMG #16-G-12627, P24-5 modified per FTRC dwg FRB-27925-1; part no. A1001480	Shielding for Type 12AT7 Tubes (V601, V602, V603)
E604-1 to E604-4	N17-I-49498-4210	INSULATOR, bushing: shoulder; phenolic Textolite #1422; 0.250″ lg x 0.375″ OD x 0.1885″ ID; stepped to 0.293″ ID 1/16″ from one end; FTRC dwg FRB-23317-1, part no. A1000720	PA Capacitor Rotor Shaft Insulation
E605	N16-D-46337-9481	DIAL: same as E104, except (1) for 0.187″ diam shaft, (2) dial has two 180° divisions, each division calibrated with short radial lines spaced 9° apart at circumference, with alternate lines (18° spacing) numbered "0" thru "9" clockwise and (3) RH setscrew is 60° to right of one "0" mark; FTRC dwg FRA-23141-2-1, part no. A1001455-1	Control for PA Tuning (C645)
E606	N16-D-46337-9491	DIAL: same as E104, except (1) dial is calibrated with four short radial lines spaced 90° apart at circumference and numbered "1" thru "4" counterclockwise and (2) LH setscrew is at numeral "3" FTRC dwg FRA-23141-2-4, part no. A1001455-4	Control for Crystal Transfer Switch S601
E607	N16-D-46337-9489	DIAL: same as E104, except (1) for 0.137″ diam shaft, (2) 360° of dial is calibrated with short radial lines spaced 18° apart at circumference, with alternate lines (36° spacing) numbered "0" thru "9" clockwise and (3) RH setscrew is 90° to left of "0" mark; FTRC dwg FRA-23141-2-7, part no. A1001455-7	Control for PA Grid Tuning

E608		DIAL: same as E605, except (1) calibrated counterclockwise, (2) for 0.251 shaft; part no. A1001455-5	Control for Driver Tuning (C605)
E609-1 to E609-2	N16-K-700266-881	KNOB: round type; black; copper pl bronze, lacquer dipped; for 0.250″ diam shaft; mtd by #6-32 thd x 3/16″ lg Allen headless hollow cup-point steel setscrew and #6/0 x ⅝″ lg SS taper pin in 0.062″ (#52 drill) radial hole 90° clockwise from screw; curved white arrow (wax filled) on top, 3/16″ radius x 1/32″ wd x 180° lg, clockwise from pin; ½″ lg x ⅝″ diam o/a; 0.251″ diam x 5/16″ d shaft hole; 40 turns per inch straight knurl; FTRC dwg FRB-23144-1, part no. A1001460 (plus nonmagnetic setscrew and pin)	Control for Lock for PA Tuning and for PA Grid Tuning
E610-1 to E610-2	N16-P-500001-143	POINTER, indicaor: bronze copper pl; for 3/16″ diam shaft, ⅞″ lg x ⅜″ wd x ¼″ h; mtd by 0.188″ diam x 0.187″ d shaft hole and single #6-32 thd x ⅛″ lg Allen headless hollow cup-point steel setscrew located 90″ counterclockwise from index line; line 0.015″ wd, filled with white; FTRC dwg FRC-23145-2, part no. B1001461	Tuning Indicator for RF Driver and for Power Amplr and for PA Grid
E611-1 to E611-5	N17-I-59404-5595	INSULATOR, feed-thru: cylindrical with axial wire leads: 11/16″ lg o/a x 0.125″ diam of body x 0.225″ OD of flange; term 0.040″ wire, glass ins, tin dipped with 0.045″ hole in flattened ends; 750 v AC peak at 90% humidity; 5 amp for 40° C cont temp rise; CBEF #A-40-W-PP; FTRC par no. 340074	Crystal Lead Feed-thru and Driver Tank Feed-thru
E612-1 to E612-2	N17-B-86231-1301	BRUSH, electrical cont: slip ring brush, carbon; rectangular 1-3/32″ lg x 0.249″ wd x 0.185″ thk; 0.206″ OD x 1-9/32″ lg (free length); beryllium copper spring attached to free end of brush; brass cap on springs; shunt wire coaxial with spring, and c/o 4 strands each 33 lengths #44 wire; concave contact surface, 15/32″ radius; CMBX #KC-9173 FTRC part no. 791000	Brush for Blower B601 (Rotron Model D, Type US-2503)
E613-1 to E613-3	N17-I-69178-7126	INSULATOR, stand-off: JAN type NS3W0208; cylindrical; grade III white glazed ceramic; 1″ lg x ½″ diam with #8-32 thd x ⅜″ d tapped axial hole each end; spec JAN-I-8	Support for Stators of C645
E614	N17-I-69154-6196	INSULATOR, stand-off: JAN type NS3W0104; cylindrical; grade III white glazed ceramic; ½″ lg x ⅜″ diam with #6-32 thd x 5/32″ d axial hole each end; spec JAN-I-8	Supports for Tripler for Plate Clamp
E615-1 to E615-2	N17-B-86311-8661	BRUSH, electrical cont: carbon; rectangular, ⅞″ lg x 0.375″ wd x 0.250″ thk, w/special spring 17/32″ lg; concave contact surface; brush rests in rect brass slot; 1-3/16 lg (approx) pig-tail c/o 2 strands ea 33 lengths #40 AWG copper wire which makes electrical contact w/free end of brush on one end and brass contact cap on other end; carbon, grade E29; commutator brush; Pure Carbon Co., part no. 2-113-1, FTRC part no. 749390	Brush for Blower B601 (Howard Model 715-1)
F401‡	N17-F-14306-510	FUSE, cartridge: time delay; 8 amp; blow time 60 min at 135% rated load 25 sec at 200%, 8 sec at 300% 3 sec at 500%; one time; glass body; nonindicating; ferrule term; ¼″ diam x 1¼″ lg; CFA #MDL-8, FTRC part no. 880087	Main Line Protection

†Make from SNSN N16-S-34576-6513.
‡For 115 v line

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
F401‡‡	N17-F-14305-60	FUSE, cartridge: Navy type -28060-4; time delay; 4 amp; blow time 60 min at 135%, 25 sec at 200%, 8 sec at 300%, 3 sec at 500%, one time; glass body; ferrule term; nonindicating; ¼" diam x 1¼" lg; CFA #MDL-4, FTRC part no. 880084	Main Line Protection
F402‡		Same as F401‡	Main Line Protection
F402‡‡		Same as F401‡‡	Main Line Protection
F403‡		Same as F401‡	Spare
F403‡‡		Same as F401‡‡	Spare
F404	N17-F-16302-40	FUSE, cartridge: ¼ amp: 110% continuous, blow time 1 hr at 135%, glass body; ferrule term, CFA #AGC-¼, FTRC part no. 880037	Mod Plate Protection
F405		Same as F404	Spare
H101	16-T-751512-134	TOOL, alignment: plastic body; 6⅛" lg x ¼" diam o/a; recessed screw nib on one end, metal scdr on other end; ICA part #6166; FTRC part no. A1003596	Tuning Adjustment Tool
H102	G41-W-2449	WRENCH: for #6 hex socket head screw; 2-3/32" lg x ¾" wd x 3/32" between flats; alloy steel; 90° bend 21/32" from one end (L-shape): CAYT #6, part no. 121502	Tool for Knobs and Couplings
H103	N16-P-94101-1008	PULLER, tube: U-shaped steel strip with hook formed at end of each leg; #22 ga USS CRS strip 55; 1¾" wd x 3⅜" h x 7/16" d o/a; FTRC dwg FRB-24649-1, part no. A1003595	Tool for Extracting Type 4X150A Tubes
H104-1 to H104-2	N16-C-301801-585	CLAMP: radio dial lock; nickel pl brass: one ⅜" hex nut; 1⅜" lg x ½" diam with #10-32 thd mtg stud; for dial up to 3/32" thk; ⅜" diam cap fine knurl; lockwasher; CJA #10050, FTRC part no. 324000	Lock for Speech and Mod Gain Controls (R101 and R115)
H105	*N16-R-503580-218	RETAINER, tube: c/o octagonal plate 4⅞" lg x 2½" wd x ⅛" thk w/two 1⅝" diam holes 2¾" c to c and expansion spring riveted to center of plate 2" lg x ¼" diam; plate from ⅛" thk laminated thermosetting plastic, spring from .026" diam music wire, zinc pl; 4⅞" lg x 2½" wd x 2" h w/spring contracted, 3-9/16" h w/spring extended; two #12 (.189) drill mtg holes for studs, 2¾" c to c; FTRC dwg FRA-32904-1, part no. A1002383	Retainer for Type 807 Tubes (V105-V106)

H106-1 to H106-24	N43-S-17365-215	SCREW, set: Allen hex socket drive; headless; steel with copper flash and chromated zinc; #6-32 thd x 3/16″ lg; cup point, FTRC part no. 114057	For Knobs, Dials and Couplings including Mod., P.S., RF Unit, and Remote Unit
H107-1 to H107-6	N43-S-17365-210	SCREW, set: Allen hex socket drive; headless; steel with copper flash and chromated zinc; #6-32 thd x ⅛″ lg; cup point; FTRC part no. 114052	For Knobs, Dials and Couplings including Mod., P.S., RF Unit, and Remote Unit
H401	N16-L-150001-131	LATCH, fastener: manganese bronze and SS; lever type: 4⅝″ lg x ⅝″ wd x 19/32″ h o/a; mtd by two 5/32″ holes spaced 13/16″ c to c; for RH operation; FTRC dwg FRB-22806-2-1, part no. A1002724-1	Modulator Unit Latch
H402	N16-L-150001-130	Same as H401, except for LH operation; FTRC dwg FRB-22806-2-2, part no. A1002724-2	RF Unit Latch
H403	N42-L-2605-8250	LATCH, fastener: steel, cad pl; slotted head type; 0.601″ lg x ½″ OD; mounts in 7/16″ diam hole; Camloc type #2600-4, FTRC part no. 315015	K403 Relay Shelf
H404	N42-C-13390-2025	CATCH, fastener: steel, cad pl; 1″ lg x ½″ wd; two 3/32″ diam holes on 0.750″ mtg/c; Camloc part #212-12 FTRC part no. 315009	Used with H403
H405-1 to H405-2	*N16-L-150001-132	LATCH, fastener: c/o cad pl steel catch, black Ebonol finish steel barrel, cad pl steel spring and black Ebonol finish steel stud; 15/16″ lg x ½″ wd x ⅞″ h o/a; single hole mtg; FTRC dwg FRB-27713-1, part no. A1002735	To Lock Front Doors
H406-1 to H406-7	N17-T-28218-4116	TERMINAL, stud; general use; style #21; brass, silver pl, with paper lam phenolic ins; 13/16″ lg x 5/16″ across flats; #6-32 thd on mtg stud ¼″ lg; breakdown voltage 6000 v RMS at 60 cps; CAMQ type X-1581-B, FTRC part no. 340071	Support for Resistor R414
H407-1 to H407-2	N43-W-7104-3040	WASHER, lock: cad pl spring steel; 0.015″ thk x 0.450″ OD x 0.250″ ID; 5 dimpled teeth around inner circumference; Camloc part #2600-LW, FTRC part no. 315200	Used with H405
H601	N16-C-304055-501	CLAMP, electron tube clamp; phosphor bronze; single #8-32 thd clamping screw; 2-13/16″ lg x 2⅜″ wd x ⅝″ h o/a; clamping range 1⅝″ min to 1⅞″ max; has one Patton-McGuyer #5004 lug; two mtg feet with 0.170″ x 0.230″ slots; FTRC dwg FRA-23443-1, part no. A1001108	Retainer for Type 4X150-A Tube (V604)
H602-1 to H602-12	N42-L-2605-8075	LATCH, fasener: steel, cad pl; slotted head type; 0.471″ lg x 0.437″ diam; mounts in 0.468″ min diam hole; Camloc type #2700-4, FTRC part no. 315187	RF Unit Side Panels
H603-1 to H603-16	N42-L-2605-8100	LATCH, fastener: steel, cad pl; slotted head type; 0.501″ lg x 0.437″ OD; mounts in 0.468″ min diam hole; Camloc type #2700-5, FTRC part no. 315188	RF Unit Side Panels
H604		Same as H404	Used with H602 and H603

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.
‡For 115 v line
‡‡For 230 v line

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
H605-1 to H605-28	N43-W-5994-9510	WASHER, lock: stainless steel; round; 0.019″ thk x 5/16″ OD x 5/32″ ID; split type; Camloc part #2700-SW, FTRC part no. 315201	Used with H602 and H603
I401	N17-L-6543-200	LAMP, incandescent: 12-16 v; type T-3¼ bulb; 1-3/16″ lg miniature bayonet base; type 6-2R fil, burn horiz; G. E. Supply Corp type #1815, FTRC part no. 710055	Power ON Indication
I402		Same as I401	Carrier ON Indication
J101	N17-C-73330-501	CONNECTOR, receptacle: 23 round female cont, asymmetrical arrangement straight type; 300 v, 8 amp rating; all cont except #7, #13, #16 and #23 are 15 amp, #10 and #12 are 500 v, and 11 is 1000 v; CARO #F23A, FTRC dwg FRE-22953-2, part no. B1002255	Audio Section Input and Output Connections (u/w P401)
J401	N17-J-39420-4297	JACK, telephone: Navy type -49039A, JAN type JJ-033 (less locating pin): for 0.2065″ diam 3 conductor plug; 1.245″ lg x 0.937″ wd x ¾″ h o/a; J2 cont arrangement; incl ⅜″-32 thd x 7/32″ lg mtg bushing with hex nut, 2 phenolic washers; no locating pin; same as Sig C jack JK-33-A (less loc pin); spec JAN-J-641	Microphone Connection
J401A	N17-C-201579-715	CAP: aluminum, red semi-gloss enamel finish; spring hinge, normally closed, opens to 90°; 27/32″ lg x 23/32″ OD; 0.380″ diam hole in fixed part mts around bushing and under nut of associated jack; 1/16″ thk pad inside cover; Croname Co. part #A-21570, modified per FTRC dwg FRB-23259-1-1, part no. A1002746-1	Moisture and Dust Cover for Jack J401
J402	N17-J-39248-4423	JACK, telephone: navy type -49025B; for 2-conductor ¼″ diam plug; 1.271″ lg x 1″ wd x ¾″ h o/a, approx; J1 cont arrangement; ⅜″-32 thd x ⅜″ lg mtg bushing, incl hex nut, phenolic 2 washers; no locating pin; BuShips dwg RE49AA195	Earphone Connections
J402A	N17-C-201579-717	Same as J401A, except white finish; FTRC dwg FRB-23259-2 part no. A1002746-2	Moisture and Dust Cover for Jack J402
J403	N17-C-72252-1001	CONNECTOR, receptacle: 5 round female cont, pol; straight type; AN Aero Std type AN-3102-14S-5S; FTRC dwg FRE-22933-1, part no. A1003186	Handset Connections
J501	N17-C-71317-6092	CONNECTOR, plug: 18 silver pl rectangular cont (arr 6 vert in one row and 6 horiz in 2 rows) in rectangular molded Bakelite insert; rectangular metal shell; straight type: 45 v, 5 amp rating; CJC #S-318-CCE, cad pl plus silver pl; FTRC dwg FRE-27856-1, part no. A1004235	External Connections to Power Supply

J502	N17-C-73114-7071	CONNECTOR, receptacle: 1 round female cont, coaxial; straight type; 500 v peak; 52 ohms characteristic impedance; for RG-55/U or RG-58/U cable; CARO #36000, FTRC part no. 755562	Receiver Output Connection
J503		Same as J502	Antenna Connection
J601	N17-C-73309-7501	CONNECTOR, receptacle: 15 round female cont; symmetrical arrangement; straight type; 300 v, 8 amp cont rating all cont except #3 and #4 are 525 v, #1 and #15 are 15 amp and #13 is 525 v plus modulating voltage; CARO #F15B per FTRC dwg FRE-22951-2, part no. B1001745	RF Section Input and Output Connections
J602	N17-C-73108-7477	CONNECTOR, receptacle: 1 round female cont, coaxial, straight type; 500 v peak; 52 ohms characteristic impedance; CARO #5575, FTRC part no. 755561	RF Drive Output Connections
J603		Same as J602	PA Input
J604		Same as J602	RF Output
K101	N17-R-65331-9819	RELAY, armature: cont; 2A arrangement, 3 amp at 32 v DC or 115 v AC rating, weld resistant palladium; coil single wnd, 45 v DC (calc); 60 DC ma max, 15 DC ma max pick-up, 750 ohms DC resistance; 6 solder lug term; 1⅜″ h o/a x 1″ wd x 1⅜″ lg; fast acting; mtd by 7 tapped (6-32) holes; two centered ¾″ c to c in end of heelpiece on line 11/32″ from base, four on 1-1/16″ and ¾″ ctr in base, and seventh centered between and in line with two in base, near heel end; pile-up and coil impr w/polymerizing varnish and dipped in ins varnish; CSD #181BXX; FTRC dwg FRE-24316-1, part no. A1002256	Transmitter Keying
K401	N17-R-65528-1801	RELAY, armature: cont 2A1B2C; cont rated 3 amp at 32 v DC or 115 v AC; palladium cont; single coil, current 30 ma DC max, 15 ma DC pick-up, 3000 to 4000 ohms DC resistance, ins coil; 14 solder lug term; 1⅜″ lg x 1″ wd x 1⅞″ h o/a; mtd by seven #6-32 tapped mtg holes irregularly spaced; fast acting; coil impr w/polymerizing varnish and dipped in ins varnish; CSD #181BBA101; FTRC dwg FRE-24317-1D, part no. A1002695	Carrier Control Relay
K402	N17-R-64123-7121	RELAY, armature: cont: 2A2A arrangement, rated at 5 amp at 115 v AC or 24 v DC, and ½ amp at 115 v DC, weld-resistant palladium; coil; single wnd, 110 v AC, 50/60 cps, 120 ma approx, 310 ohms DC resistance; 10 solder lug term; 1¾″ lg x 1″ wd x 2-1/16″ h o/a; mtd by 6 tapped (#6-32) holes: four in base on ⅞″ and ¾″ ctr, and two in end centered ¾″ c to c on line 11/16″ from base; fast acting; impr for tropical use and RSW; CSD #218DXX, FTRC dwg FRE-24318-1, part no. A1002694	Equipment Start-Stop
K403	N17-R-65577-6501	RELAY, armature: cont: SPDT, coaxial 150 v and 3 amp at 400 mc; coil; single wnd, 30 DC ma max, 15 DC ma max pickup, 4000 ohms ±10% DC resistance; solder lug term; three type BNC RF connectors for cont; 2-5/16″ wd x 1-17/32″ h x 2¼″ d o/a; three 0.140″ diam mtg holes at apexes of isosceles triangle having ¾″ base and ½″ altitude; fast acting; oper at –40°C to +65°C and 0–95% RH; for use in 50-ohm line at 225-400 mc; CSD #181XAX101; FTRC dwg FRE-24319-1, part no. A1002717	Antenna Change over

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
L401	N16-R-29783-2100	REACTOR: filter choke: dual sect, iron core; 1st 3 hy at 500 DC ma and 240 v RMS 120 cps, 32.4 ohms DC resistance; 2nd sect: 3 hy at 370 DC ma and 25 v RMS 120 cps, 47.5 ohms DC resistance; 2500 v RMS test each wnd; HS case 3-5/16" sq x 8-15/16" h o/a, excl term: four #8-32thd x 15/32" lg mtg studs on 2-11/16" x 2-11/16" ctr on bottom of case; three 13/16" lg solder lug term with 7/16" diam ins bushings on bottom centered 5/8" c to c on line 1/2" from one edge; spec MIL-T-27 and FTRC dwg FRE-18381-1, part no. A1002817	Plate Rectifier Filter
L402	N16-R-29758-4501	REACTOR: filter choke; dual sect, iron core; sect #1, 0.08 hy at 660 ma and 7 v RMS, 120 cps; sect #2, 0.08 hy at 660 ma and 3 v RMS, 120 cps; 1.51 ohms DC resistance and 1500 v RMS test, each sect; HS metal case, 2-3/16" d x 2-13/16" wd x 5 3/8" h o/a, excl term; four #8-32 thd x 15/32" long studs on 1 1/8" x 2 1/4" mtg ctr; three 1/2" h pillar type term with 7/16" diam ins bushings on bottom, centered 3/8" c to c on line 11/32" from one edge; spec MIL-T-27 and FTRC dwg FRE-19525-1, part no. A1002818	12-volt Rectifier Filter
L403	N16-R-29765-7385	REACTOR: filter choke (95-126 cps oper); dual; 1st sect: 0.5 hy at 130 DC ma and 35 v RMS, 120 cps; 2nd sect: 0.5 hy at 130 DC ma and 0.3 v RMS, 120 cps; 25 ohms DC resistance and 1500 v RMS test each wnd; HS metal case, 1 1/8" wd x 1 1/2" d x 4 1/8" h o/a excl term; two #8-32 thd x 15/32" lg mtg studs centered 15/16" c to c on shorter ctr line of bottom of case; four 1/2" lg pillar type solder term with ins bushings located two each side of shorter ctr line on bottom and 13/32" from it; left pair spaced 3/8" apart and 3/8" from rear edge, right pair spaced 3/8" apart and 3/8" from front edge, ctr; spec MIL-T-27 and FTRC dwg FRE-18263-1, part no. A1002819	42-volt Rectifier Filter
L601	N16-C-73313-1069	COIL, RF: choke, single wnd, single layer wnd; unshielded; 21 uh at 20-60 mc, 0.6 amp; 2.4 ohms DC resistance; 0.6 uuf distrib capacity; 115 turns #34 AWG wire; 1 3/4" lg x 5/16" OD; steatite form, air core; term mtg; 1 1/2" radial wire leads welded to lug type term, one each end; wnd mp and ins; COM #Z-28, FTRC part no. 592117	Oscillator Plate Choke
L602	16-C-76320-5962	COIL, RF: oscillator circuit: one wnd, single layer wnd; unshielded; 11 RH turns of 0.064" diam x 1/2 HD copper wire w/0.002" thk silver jacket; 2 1/8" lg max x 2 1/2" h x 1 1/4" wd o/a; steatite form, iron core; 1 3/4" lg x 0.643" OD; adjustable iron core; scdr adj; one 0.273" mtg holes and one 0.163" x 0.203" mtg slot on 1 1/4" mtg/c in bkt; one side of coil attached to bkt other terminated by coil wire; FTRC part no. A1001009-8	Oscillator Plate Tuning
L603	N16-C-73043-1051	COIL, RF: choke; single wnd, single layer wnd; unshielded; 7 uh at 35-110 mc, 1 amp; 0.894 ohms DC resistance; 0.5 uuf distrib capacity; 57 turns #33 AWG wire; 7/8" lg x 9/32" OD; low PF plastic core (& form); term mtg; one 1" lg axial wire lead each end; wnd mp coating; COM #Z-50, FTRC part no. 592118	Doubler Plate Choke

L604	16-C-76233-5005	COIL, RF: one wnd, single layer wnd; unshielded; 5 RH turns of 0.064" diam ½ HD copper wire w/0.002" thk silver jacket; 2⅛" lg (max) x 2¼" h x 1¼" wd o/a; steatite form, brass core; 1-3/16" lg x 0.643" OD; adj brass core; scdr adj; one 0.273" mtg hole and one 0.163" x 0.203" mtg slot on 1¼" mtg/c in brass bkt; one side of core, attached to bkt, other terminated by coil wire; FTRC part no. A1001009-7	Doubler Plate Tuning
L605		Same as L603	RF Amplr Plate Choke
L606		Same as L603	RF Amplr Cathode Choke
L607		Same as L604	RF Amplr Plate Tuning
L608	N16-C-72841-1021	COIL, RF: choke; single wnd, single layer wnd; unshielded; 1.8 uh at 80-200 mc, 1 amp; 0.294 ohms DC resistance; 0.5 uuf distrib capacity; 35 turns #32 AWG wire; ¾" lg x 3/16" OD; low PF plastic rod core and form; 1½" axial wire lead each end; term mtg; wnd mp coated; COM #Z-144	Tripler Plate Choke
L609	N16-C-76198-5144	COIL, RF: variable tuning inductance; single layer, space wnd; unshielded; 2 turns 0.060" diam ½-hard copper wire (silver plated to 0.064" OD); 2⅛" lg x 2½" h x 1¼" wd; steatite form 1½" lg x ½" OD x 0.380" ID; adjustable brass core 11/32" OD x 1½" lg o/a with #6-32 x 1" lg thd one end, screwdriver slot each end all silver pl; one 0.273" mtg hole and one 0.163" x 0.203" mtg slot on 1¼" ctr in brass bracket; 2 coil leads are term; FTRC dwg FRE-23392-2-1, part no. A1001009-6	Tripler Plate Tuning
L610	*16-C-71627-1968	COIL, RF: one wnd, single layer wnd; unshielded; 1½ turns 0.060" diam ½ HD copper wire w/0.002" thk silver jacket; 0.503" OD x approx ¼" lg less term; term mtd; one side terminated by coil wire, other side has solder lug term; FTRC part no. A1001027-2	Tripler Plate Tuning
L611	*N16-C-71662-7638	COIL, RF: coupling; single wnd, single layer space wnd; unshielded; 2 turns 0.060" diam ½ hard copper wire (silver pl to 0.064" OD); 1-27/32" lg x 13/16" wd x 17/32" h; air core; term mtg; 2 wire leads, one 1½" lg and one ⅞" lg from ctr of coil; FTRC dwg FRE-23460-1, part no. A1001742	Tripler Output Coupling
L612	N16-C-71613-1970	COIL, RF: coupling; single turn loop; unshielded; 1-15/32" lg x 1⅛" wd x ¼" thk o/a; air core; space wnd (¾" ID); single turn 0.060" diam ½-hard copper wire (silver pl to 0.064" OD); one crimpon ⅛" diam copper rod term and one spade lug term soldered at each end of coil; term mtg; FTRC dwg FRE-24322-1, part no. A1001193	PA Grid Input Coupling
L613	*16-C-71651-9806	COIL, RF: grid tuning: single wnd, single layer space wnd; unshielded; 2 turns #8A. W.G. SD copper wire; 1⅛" OD x ⅞" lg excl term; air core; ⅞" ID; one screw lug term each end; term mtg on 1⅞" ctr; FTRC dwg FRB-23019-1, part no. A1000837-2	PA Grid Tuning
L614	*16-C-71651-8451	COIL, RF: grid tuning: single wnd, single layer wnd; unshielded; 2 turns #8 A W.G. SD copper wire; ¾" OD x ⅞" lg excl term; air core; space wound; ½" ID; one screw lug term at each end of coil, each drilled for screw term mtg on 1⅞" mtg ctr; FTRC dwg FRB-24325-1, part no. A1000836-2	PA Grid Tuning

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
L615	16-C-71700-3920	COIL, RF: one wnd, single layer wnd; unshielded; 2½ LH turns of #8 B & S gab are soft copper wire, 1¾" lg x 1⅛" wd x ¾" h less term; term mtd; 2 solder lug term on each end; FTRC part no. A1002180-2	Power Amplifier Plate Tuning
L616		COIL, RF: one wnd, single layer wnd; unshielded; 2½ LH turns of #8 B & S ga bare soft copper wire, 1¾" lg x 1⅛" wd x ¾" h less term; term mtd; 2 solder lug term on ea end; FTRC part no. A1002180-3	Power Amplifier Plate Tuning
L617		Same as L608	PA Plate Choke
L618	16-C-71598-6575	COIL, RF: one wnd, single layer wnd; unshielded; 1 turn of #8 B & S ga bare soft copper wire; 1.007" OD x approx 0.285" lg, less term; term mtd; 2 solder lug term on ea end; FTRC part no. A1002180-1	Power Amplifier Output Coupling
L619	N16-C-72768-8717	COIL, RF: choke; single wnd, single layer wnd; unshielded; 0.84 uh at 160-350 mc, 1 amp; 0.049 ohms DC resistance; 0.34 uuf distrib capacity; ¾" lg x 3/16" OD; low PF plastic rod core and form; term mtg; one 1½" axial wire lead each end; wnd MP coated; COM #Z-235	PA Screen Choke
L620		Same as L619	PA Plate Choke
L621		COIL, RF: one wnd; single layer; unshielded; 2 turns of .064" dia silver jacketed copper core; 1" lg x 9/16" wd x 15/16" h; term mtg; FTRC dwg no. A-1010542	Output Filter Tuning
M401	N17-M-21895-3688	METER, ammeter: DC; JAN type MR-25W-163-SPEC; 0.200 u amp (full scale); rnd flush mtg bakelite case; 2.21" barrel diam x 1.75" d behind flange (excl term); flange 2.695" diam 0.38" thk; 1250 ohms DC resistance; 250 mv drop between term; 0-200 u amp for full-scale deflection; calibrated for non-magnetic panel 0-150 linear scale (30 scale divisions); three 0.125" diam mtg holes in flange spaced 120° apart on 1.22" radius; spec JAN-I-6	Monitoring
O601-1 to O601-2	N16-V-230001-103	VENT, air: guides air stream across electron tube cooling fins and toward a bezel (not part of vent); polystyrene; cylindrical with varying ID; 1-7/32" lg x 1-21/32" OD; mtd by three tapped (#6-32 thd) holes parallel to axis and spaced 120° apart on 1½" diam bolt circle; FTRC dwg FRP-23552-1, part no. A1001293	RF Unit Exhaust
O602	N77-B-118-00865-3004	BEARING, ball: single row, radial; light series; felt seal one side; 0.315" bore x 0.8661" OD x 0.406" wd; SAE-51200 ball bearing steel; seven 5/32" diam steel balls; packed w/grease per AN-G-25; std fit; ABEC-1 tol; Fafnir Bearing Co. #38KT or 38 CTD; spec FS-50132; Rotron Co. #5589	Bearing for Blower B601 (Rotron Model D, Type US-2503)

O603	N17-C-98431-6221	COUPLING, rigid: sleeve type; c/o brass collars pressed onto ends of Textolite hub; hub formed to provide flange between collars; ¼″ shaft size each end; 2 pr tapped (#6-32 thd) holes; holes spaced 120° apart radially; pr located 0.093″ and 0.405″ from one end, and aligned axially; shaft ends ins; FTRC dwg FRB-27335-1, part no. A1001463	PA Tank Shaft Coupling
O604	N17-C-98431-6201	COUPLING, rigid: sleece type; ½″ OD x ½″ lg o/a; brass, silver pl; ¼″ shaft opening each end; 2 pr tapped (#6-32 thd) radial holes; holes spaced 90° apart; pr aligned axially and located 0.109″ and 0.390″ from one end of coupling: FTRC dwg FRB-26163-1, part no. A1001462 (set screws incl)	Shaft Coupling for Capacitors (C605 and C647)
O605	N16-D-901161-136	DRIVE, tuning: c/o two gears, 1 pinion and front and back plates; 2 gears ea 1/16″ thk brass, 2½″ PD, 48 DP, 120 std involute teeth with 14½° pressure angle; pinion is ¼″ PD, SS, 12 teeth; front and back plates each 1⅞″ wd x 3¼″ h x 1/16″ thk aluminum with corners cut from bottom and notch cut in top center; gears assembled with springs to form non-lash pair; 3¼″ h x 2½″ wd x 1¼″ d o/a; mtd by three 0.196″ diam holes in plates, two centered 1½″ apart on line 3/16″ below top and one 3/16″ below top and ¼″ to left of vert ctr line; FTRC dwg FRA-24846-2, part no. A1001413	Drive for PA Plate Tuning Impedance C645
O606	N16-D-901161-135	DRIVE, tuning: c/o two gears, 1 pinion, 1 double-grooved sheave and front and back assembly plates; 2 gears each 1/16″ thk brass, 2½″ PD, 48 DP; 120 std involute teeth with 14½° pressure angle; pinion is ¼″ PD, SS, 12 teeth; sheave is 1¾″ OD x 0.156″ thk brass wheel with two 0.037″ wd grooves; front and back plates each 1⅞″ wd x 3¼″ h x 1/16″ thk aluminum with corners cut from bottom and notch cut in top center to clear mtg holes; gears assembled with spring to make non-lash pair; mtd by three 0.196″ diam holes at apexes of isoceles triangle having 1½″ base and 2⅞″ alt; FTRC dwg FRA-24878-2 part no. A1001347	Drive for PA Grid Tuning Capacitors C637A, C637B, C637C
O607	16-D-901161-162	DRIVE, tuning: mechanically operated; 180° continuous operation; selector knob actuation; 2½ in. lg. 1-11/32 in. wide w/shaft 23/32 in. w/c shaft, 1¾ in. high, for capacitor tuning; FTRC part no. A1002295-1 non-lash pair; part no. A1002295-1	RF Driver Tuning
O608		BEARING, ball: single row, radial; light duty; two seals, diaphragm type; 0.315″ bore x 0.8661″ OD x 0.2756″ wd; seven 5/32″ diam steel balls; packed w/grease per AN-G-25; std fit; ABEC-1 tol; CGM #99038, CASN #BRG 29-2, FTRC part no. 440008	Bearing for Blower B601 (Howard Model 715-1)
P401	N17-C-73627-1001	CONNECTOR, receptacle: 23 round parallel male cont in asymmetrical arrangement; straight type; cont rated at 300 v, 8 amp, except #7, #13, #16 and #23 are 15 amp, #10 and #12 are 500 v and #11 is 1000 v; CARO #M23A; FTRC dwg FRE-229-52-2, part no. B1002821	Audio Unit Input and Output Connections (Mates with J101)
P402	N17-C-73597-1001	CONNECTOR, receptacle: 15 round male cont in asymmetrical arrangement straight type; cont rated at 300 v, 3 amp, except #3 and #4 are 525 v, #1 and #15 are 15 amp and #13 is 525 v plus mod voltage; CARO #M15B, FTRC part no. B1002822	Input and Output Connections to RF Section

TABLE 8—2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
P403	17-C-73605-9149	CONNECTOR, receptacle: 18 rectangular male cont; straight type; cont rated at 45 volts, 5 amp; angle brackets for mtg; CJC #S-318-CCE, mod per FTRC dwg #FRE-27855-1, part no. A1002824	External Connections to Power Supply
P501	N17-C-71408-3241	CONNECTOR, plug: AN type UG-88/U; 1 round coaxial male cont; straight type; 52 ohms characteristic impedance; Navy spec RE49F246	Receiver Connection to Relay K403
P502		Same as P501	Antenna Connections to Relay K403
P503	N17-C-71416-2550	CONNECTOR, plug: AN type UG-21B/U; 1 round coaxial male contact; straight type; 52 ohms characteristic impedance	Connections from External Recr to Ant
P504		Same as P503	External Antenna Connection
P601		Same as P501	Ouput of RF Secion
P602		Same as P501	Transmitter Connection to Relay K403
R101	N16-R-88079-4135	RESISTOR, variable: comp; 250,000 ohms ±10%; 2 watts at 70°C; 3 radial solder lug terms; encl plastic can with metal cover; 1-1/16″ diam x 9/16″ d; round metal shaft ¼″ diam x 11/16″ lg FMS; std "L" taper (Allen Bradley "A" taper); ins cont arm; no off pos; normal torque; ⅜″ –32 NEF – 2 thd x ¼″ lg mtg bushing with non-turn device at 9 o'clock pos on 17/32″ radius; CBZ type JA-2541; FTRC dwg FRE-20914-2-2, part no. B1002257-2	Speech Amplr Gain Conrol
R102	N16-R-50975-811	RESISTOR, fixed: comp; JAN type RC20BF105K; 1 megohm ±10%; ½ watt; spec JAN-R-11	AVC Feedback Divider
R103	N16-R-51020-811	RESISTOR, fixed: comp; JAN type RC20BF155K; 1.5 megohms ±10%; ½ watt; spec JAN-R-11	Speech Amplr Input Divider
R104	N16-R-50633-811	RESISTOR, fixed: comp; JAN type RC20BF104K; 100,000 ohms ±10%; ½ watt; spec JAN-R-11	Speech Amplr Plate Load
R105	N16-R-50633-125	RESISTOR, fixed: comp; JAN type RC42BF104J; 100,000 ohms ±5%; 2 watt; spec JAN-R-11	Speech Amplr Screen Dropping
R106	N16-R-50335-431	RESISTOR, fixed: comp; JAN type RC20BF153J; 15,000 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500343	Speech Amplr Screen Bleeder

R107	N16-R-50822-811	RESISTOR, fixed: comp; JAN type RC20BF474K; 470,000 ohms ±10%; ½ watt; spec JAN-R-11	AVC Feedback Divider
R108	N16-R-50714-811	RESISTOR, fixed: comp; JAN type RC20BF224K; 220,000 ohms ±10%; ½ watt; spec JAN-R-11	AVC Amplr Grid Leak
R109	N16-R-50337-528	RESISTOR, fixed: comp; JAN type RC42BF153K; 15,000 ohms ±10%, 2 watt; spec JAN-R-11	AVC Amplr Plate Load
R110	N16-R-50373-231	RESISTOR, fixed: comp; JAN type RC30BF223K; 22,000 ohms ±10%; 1 watt; spec JAN-R-11	AVC Delay Volt
R111		Same as R108	AVC Delay Volt Divider
R112	N16-R-50759-811	RESISTOR, fixed: comp; JAN type RC20BF334K; 330,000 ohms ±10%; ½ watt; spec JAN-R-11	AVC Rectifier Load
R113	N16-R-88009-4520	RESISTOR, variable: comp; 100,000 ohms ±10%; 2 watts at 70° C; 3 radial solder lug terms; encl plastic can with metal cover; 1-1/16" diam x 9/16" d; round metal shaft ¼" diam x ¾" lg FMS with scdr slot; linear taper; ins cont arm; no off pos; normal torque; ⅜"-32NEF-2 thd x ½" lg locking type mtg bushing with non-turn device at 9 o'clock pos on 17/32" radius; CBZ type JLU-1041; FTRC dwg FRE-20914-2-3, part no. B1002257-3	Clipping Symmetry Adjustment
R114		Same as R104	Clipper Cathode
R115	N16-R-88009-4213	RESISTOR, variable: comp; 100,000 ohms ±10%; 2 watts at 70° C; 3 radial solder lug terms; encl plastic can with metal cover; 1-1/16" diam x 9/16" d; round metal shaft ¼" diam x 11/16" lg FMS; linear taper; ins cont arm; no off pos; normal torque; ⅜"-32NEF-2 thd x ¼" lg mtg bushing with non-turn devices at 3 and 9 o'clock pos on 17/32" radius; CBZ type JU-1041; FTRC dwg FRE-20914-2-4, part no. B1002257-4	Modulation Level Adjustment
R116		Same as R102	Filter Amplr Grid Leak
R117	N16-R-49939-431	RESISTOR, fixed: comp; JAN type RC20BF122J; 1200 ohms ±5%; ½ watt; spec JAN-R-11	Filter Amplr Cathode Bias
R118		Same as R117	Driver Cathode Bias
R119	N16-R-49582-291	RESISTOR, fixed: comp; JAN type RC20BF101M; 100 ohms ±20%; ½ watt; spec JAN-R-11	Parasitic Suppressor
R120		Same as R119	Parasitic Suppressor
R121	N16-R-88339-4481	RESISTOR, variable: comp; 1 megohm ±10%; 2 watts at 70° C; 3 radial solder lug terms; encl plastic can with metal cover; 1-1/16" diam x 9/16" d; round metal shaft ¼" diam x ¾" lg FMS with scdr slot; std "L" taper (Allen Bradley "A" taper); ins cont arm; no off pos; normal torque; ⅜"-32NEF-2 thd x ½" lg locking type mtg bushing with non-turn devices at 3 and 9 o'clock pos on 17/32" radius; CBZ type JLA-1051; FTRC dwg FRE-20914-2-5, part no. B1002257-5	Expansion Level Adjustment

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
R122	N16-R-50554-291	RESISTOR, fixed: comp; JAN type RC20BF683M; 68,000 ohms ±20%; ½ watt; spec JAN-R-11	Multivibrator Input Divider
R123	N16-R-49876-431	RESISTOR, fixed: comp; JAN type RC20BF821J; 820 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500313	Multivibrator Cathode Bias
R124		Same as R110	Multivibrator Plate Load
R125		Same as R109	Multivibrator Plate Load
R126		Same as R109	Multivibrator Plate Load
R127	N16-R-50634-501	RESISTOR, fixed: comp; JAN type RC42BF104K; 100,000 ohms ±10%; 2 watts; spec JAN-R-11	Multivibrator Grid Leak
R128	N16-R-50418-457	RESISTOR, fixed: comp; JAN type RC42BF333K; 33,000 ohms ±10%; 2 watts; spec JAN-R-11	Volume Expander Diode Load
R129		Same as R107	Volume Expander Diode Load
R130		Same as R102	Volume Expander Clamping
R131	N16-R-88412-5369	RESISTOR, variable: comp; 2.5 megohms ±20%; 2 w; 3 radial tap term; encl plastic case w/metal cover; 1-1/16" diam x 9/16" d; metal shaft slotted ¼" diam x ¾" lg; linear taper; ins cont arm; no off pos; normal torque; ⅜"-32 thd x ½" lg locking mtg bushing w/non-turn device at 3 and 9 o'clock on 17/32" rad; CBZ type JLU-2552, FTRC dwg FRE-20914-2-7, part no. B1002257-7	MCW Carrier Holding Time Constant Adjustment
R132		Same as R102	MCW Carrier Holding Time Constant Adjustment
R133		Same as R107	Phone Driver Grid Leak
R134	N16-R-50165-811	RESISTOR, fixed: comp; JAN type RC20BF562K; 5600 ohms ±10%; ½ watt; spec JAN-R-11	MCW Osc Cathode Bias
R135	N16-R-50893-431	RESISTOR, fixed: comp; JAN type RC20BF684J; 680,000 ohms ±5%; ½ watt; spec JAN-R-11	MCW Oscillator Grid Leak
R136		Same as R135	MCW Osc Feedback
R137		Same as R135	MCW Osc Feedback

R138		Same as R135	MCW Osc Feedback
R139		Same as R104	MCW Osc Plate Load
R140		Same as R108	MCW Osc Plate Load
R141		Same as R131	MCW Mod Level Control
R142		Same as R103	Speech Amplr Grid Leak
R143	N16-R-50066-811	RESISTOR, fixed: comp; JAN type RC20BF332K; 3300 ohms ±10%; ½ watt; spec JAN-R-11	"B" Supply Filter
R144		Same as R103	Modulation Indicator
R145		Not used	
R146		Not used	
R147	N16-R-49624-751	RESISTOR, fixed: comp; JAN type RC30BF151J; 150 ohms ±5%; 1 watt, spec JAN-R-11	Mod Bias Divider
R148		Same as R147	Mod Bias Divider
R149		Same as R147	Mod Bias Divider
R150		Same as R147	Mod Bias Divider
R401	N16-R-49363-431	RESISTOR, fixed: comp; JAN type RC20BF330J; 33 ohms ±5%; ½ watt; spec JAN-R-11	Volume Expander Meter Shunt
R402	N16-R-49588-431	RESISTOR, fixed: comp; JAN type RC20BF111J; 110 ohms ±5%; ½ watt; spec JAN-R-11	PA Grid Meter Shunt
R403	N16-R-49804-431	RESISTOR, fixed: comp; JAN type RC20BF561J; 560 ohms ±5%; ½ watt; spec JAN-R-11	Tripler Grid Meter Shunt
R404	N16-R-49282-431	RESISTOR, fixed: comp; JAN type RC20BF150J; 15 ohms ±5%; ½ watt; spec JAN-R-11	Tripler Grid Meter Shunt
R405		Same as R404	Tripler Grid Meter Shunt
R406	N16-R-68297-7246	RESISTOR, fixed: WW; JAN type RW55J5RO; 5 ohms ±5%; 5 watts; spec JAN-R-26A	PA Plate Meter Shunt
R407	N16-R-66168-2450	RESISTOR, fixed: WW; JAN type RW34G312; 310 ohms ±5%; 30 watts; spec JAN-R-26A	HV Supply Voltage Dropping

TABLE 8-2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
R408	N16-R-66030-9926	RESISTOR, fixed: WW; JAN type RW34G102; 1000 ohms ±5%; 30 watts; spec JAN-R-26A	HV Supply Voltage Dropping
R409	N16-R-65846-2001	RESISTOR, fixed: WW; JAN type RW33G401; 400 ohms ±5% 18 watts; spec JAN-R-26A	HV Supply Volt Dropping
R410	N16-R-65755-7316	RESISTOR, fixed: WW; JAN type RW36G201; 200 ohms ±5%; 60 watts; spec JAN-R-26A	HV Supply Volt Dropping
R411	N16-R-87349-4418	RESISTOR, variable: comp; 1000 ohms ±10%; 2 watts at 70° C; 3 radial solder lug terms; encl plastic can with metal cover; 1-1/16" diam x 9/16" d; round metal shaft ¼" diam x 13/16" lg FMS; linear taper (Allen Bradley "U" taper); ins cont arm; no off pos; normal torque; ⅜"-32 NEF-2 thd x ⅜" lg mtg bushing with non-turn devices at 9 and 3 o'clock pos on 17/32" radius; CBZ type JU-1021; FTRC dwg FRE-20914-2-1, part no. B1002257-1	Earphone Volume Control
R412	N16-R-68369-8466	RESISTOR, fixed: WW; JAN type RW56J251; 250 ohms ±5%; 9 watts; spec JAN-R-26A	Relay K402 Current Limiting
R413	N16-R-49708-291	RESISTOR, fixed: comp; JAN type RC20BF331M; 330 ohms ±20%; ½ watt; spec JAN-R-11	Audio Line Balancing
R414	N16-R-50200-751	RESISTOR, fixed: comp; JAN type RC30BF682J; 6800 ohms ±5%; 1 watt; spec JAN-R-11	Meter (M401) Series Resistor
R415	N16-R-50200-976	RESISTOR, fixed: comp; JAN type RC42BF682J; 6800 ohms ±5%; 2 watts; Allen Bradley Co. (CBZ) #HB-6825; spec JAN-R-11	PA Screen Volt Dropping
R416		Same as R415	PA Screen Dropping
R417	N-16-R-50552-126	RESISTOR, fixed: comp; JAN type RC42BF683J; 68,000 ohms ±5%; 2 watts at 70° C; Allen Bradley Co. (CBZ) #HB-6835; spec JAN-R-11	PA Screen Bleeder
R418	N16-R-66329-6741	RESISTOR, fixed: WW; JAN type RW33G712; 7100 ohms ±5%; 18 watts; spec JAN-R-26A	300 V Bleeder
R601	N16-R-49498-431	RESISTOR, fixed: comp; JAN type RC20BF680J; 68 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500287	Parasitic Suppressor
R602	N16-R-49660-431	RESISTOR, fixed: comp; JAN type RC20BF221J; 220 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500299	Oscillator Cathode

R603	N16-R-50011-976	RESISTOR, fixed: comp; JAN type RC42BF222J; 2200 ohms ±5%; 2 watts at 70° C; CBZ #HB-2225; spec JAN-R-11; FTRC part no. 502185	Osc Plate Dropping
R604		Same as R106	Doubler Grid Leak
R605	N16-R-49687-431	RESISTOR, fixed: comp; JAN type RC20BF271J; 270 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500301	Doubler Grid Meter Shunt
R606	N16-R-49768-431	RESISTOR, fixed: comp; JAN type RC20BF471J; 470 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500307	Doubler Cathode
R607		Same as R603	Double Plate Dropping
R608		Same as R123	RF Amplr Cathode
R609		Same as R603	Ampl. Plate Dropping
R610	N16-R-50416-431	RESISTOR, fixed: comp; JAN type RC20BF333J; 33,000 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500351	Tripler Grid Leak
R611	N16-R-50335-936	RESISTOR, fixed: comp; JAN type RC42BF153J; 15,000 ohms ±5%; 2 watt; spec JAN-R-11; FTRC part no. 502205	Tripler Screen Dropping
R612	N16-R-50372-126	RESISTOR, fixed: comp; JAN type RC42BF223J; 22,000 ohms ±5%; 2 watt; spec JAN-R-11; FTRC part no. 502209	Tripler Screen Dropping
R613	N16-R-50515-976	RESISTOR, fixed: comp; JAN type RC42BF563J; 56,000 ohms ±5%; 2 watts at 70° C; CBZ #HB-5635; spec JAN-R-11; FTRC part no. 502219	Tripler Screen Bleeder
R614	N16-R-50281-976	RESISTOR, fixed: comp; JAN type RC42BF103J; 10,000 ohms ±5%; 2 watts; CBZ #HB-1035; spec JAN-R-11; FTRC part no.	PA Grid Leak
R615		Same as R614	PA Grid Leak
R616	N16-R-50281-431	RESISTOR, fixed: comp; JAN type RC20BF103J; 10,000 ohms ±5%; ½ watt; spec JAN-R-11; FTRC part no. 500339	Output Indicator Filter
R617	N16-R-70195-1001	RESISTOR, fixed: WW; 0.12 ohms ±5%; 1 watt; c/o five 1-1/16" lg folds of ⅛" wd x 0.010" thk copper-nickel alloy (1.93 ohms per ft.) ribbon in Fiberglas sleeving; 3½" lg o/a incl 1-7/32" lg natural wire lead each end; sleeving RSW and humidity; FTRC dwg FRE-24329-1, part no. A1001136-1	Tube V604 Filament Dropping
R618	N16-R-63918-2653	RESISTOR, fixed: WW; 0.072 ohms ±5%; 2 watts; c/o 3 folds ⅛" wd x 0.10" thk copper-nickel alloy ribbon with Fiberglas sleeving on Fiberglas form; 2" lg x 3/16" h x ¼" wd incl ¼" lg bare end at each end; sleeving RSW and humidity; FTRC dwg FRE-24336-1, part no. A1001746-1	Tubes V605 and V606 Filament Dropping

TABLE 8-2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
S101	N17-S-62523-1361	SWITCH, rotary: 4 pole, 2 pos, 2 throws, 12 cont; 1 sect; cont: silver pl brass, non-shorting; 1 amp rating; wax impr ceramic wafers; 1" lg x 1⅝" wd x 1⅞" h; 30° detent action; radial solder lug term; ⅜" -32 thd x ¼" lg mtg bushing; shaft ¼" diam x 23/32" lg FMS wih 13/32" lg flat; CBN type CRL-11829; FTRC dwg FRE-21672-2, part no. B1002258	MCW-PHONE Switch
S102	N17-S-72018-7719	SWITCH, toggle: SPDT; JAN type ST12D; 5 amp, 125 v resistive; rating; spec JAN-S-23	AVC On-Off
S103	N17-S-74139-4844	SWITCH, toggle: DPDT; JAN type ST22N; 5 amp, 125 v resistive; rating; spec JAN-S-23	Clipper Filter On-Off
S104		Same as S102	Volume Expander On-Off
S401	N17-S-63671-8620	SWITCH, rotary: 2 pole, 10 pos, 10 throws; 2 sect, 1 pole each sect; cont: silver pl brass, non-shorting, 1 amp rating; wax impr ceramic wafers; 1-7/32" lg x 1⅝" wd x 1⅞" h; 30° detent action; radial solder lug term; ⅜" -32thd x ¼" lg mtg bushing; shaft, ¼" diam x 23/32" lg FMS with 13/32" lg flat; CBN type CRL-11828; FTRC dwg FRE-24331-2, part no. B1002843	Meter (M401) Selector Switch
S402	N17-S-72396-1705	SWITCH, toggle: SPDT; JAN type ST40G; 15 amp, 125 v AC resistive; rating; momentary cont, normally open; spec JAN-S-23	Equipment Start-Stop
S403	N17-S-73082-9028	SWITCH, toggle: DPST; JAN type ST22K; 5 amp; 125 v resistive; rating; spec JAN-S-23	Emergency Power Switch
S404		Same as S101	LOCAL-REMOTE Selection
S405	N17-S-72396-1685	SWITCH, toggle: SPDT; JAN type ST42H; 125 v AC, 15 amp; momentary contact; spec JAN-S-23	Local Carrier Control
S601	N16-T-43276-1083	TRANSMITTER SUB-ASSEMBLY: mechanical crystal shifting device; c/o rotary switching unit, dial and knob assembly mtd on panel, and two cad pl cont with stand-off insulators mtd on chassis; rotating spool of switching unit carries 4 crystals (like CR-24/U) parallel to shaft and 90° apart (90° detents): 4 positions, 4 throws; switch alone 1-15/16" lg x 1⅝" wd x 1⅝" h o/a; with cont and insulators in installed positions, 2¼" lg x 2¼" wd x 1⅝" h o/a; FTRC dwg FRE-24332-2, part no. A1001695-1. NOTE: When supplied as spare all items packaged together but not mounted; crystals not supplied	Crystal Mechanical Transfer
S601A	*N17-C-81967-5001	CONTACT, switch: spring leaf type; brush action; 0.008" thk beryllium copper, silver pl; 5/16" lg x 3/16" wd cont area; "J" shaped; 23/32" lg x ¾" wd x 5/16" h o/a; mtd by one 0.154" OD and one 0.062" OD hole, in different planes; FTRC dwg FRB-22869-1, part no. A1001713	Spare Contact for Xtal Switch

S601B		Same as E614	Support for Contacts of Xtal Switch S601
T101	N17-T-61047-1200	TRANSFORMER, AF: input type; two pri wnd each 150 ohms impedance secd #1, 600 ohms, secd #2, 855,000 ohms; upright HS metal case; silicon steel core; 4⅛" lg x 1⅞" wd x 1-15/16" d o/a incl 7/16" metal flanges at ends; turns ratios; each pri to secd #1, 1:1.785; each pri to secd #2, 1:34; freq response 300 to 3500 cps ±1 db; 7 solder lug term on top surface; three 0.169" diam mtg holes in flanges: one hole on longer ctr line and 3/16" from one end of one flange; other two holes spaced ½" each side of longer ctr line and 3/16" from end of other flange; FTRC dwg FRE-18305-1, part no. A1003100 and spec MIL-T-27	Audio Input
T102	N17-T-65004-7500	TRANSFORMER, AF: plate coupling type; pri, 7700 ohms impedance, secd 136,000 ohms; upright HS metal case; silicon steel core; 2-7/16" wd x 1½" d x 2⅞" h (incl ½" term); 400 mw normal oper level; 1500 v RMS test; turns ratio pri to secd, 1:4.2; freq response, 300 to 3500 cps ±1 db; 5 solder term on top of case; one at ctr and others on ¾" and ⅜" ctr; four 0.169" diam mtg holes on 2 1/16" x 5/8" mg ctrs; RSW; FTRC part no. A1003501 and spec MIL-T-27	Driver-to-Modulator Interstage Coupling
T103	N17-T-65251-8800	TRANSFORMER, AF: modulation type; impedance; pri 9000 ohms, CT, 130 DC ma, secd #1, 2800 ohms at 190 DC ma, secd #2, 330 ohms, secd #3, 0.22 ohms, upright HS metal case; silicon steel core; 4" h x 2⅝ wd x 2½" d o/a, incl ½" n term; 42 watts normal oper level; turns ratio pri to secd #1, 1:0.57, pri to secd #2, 1:0.196, pri to secd #3, 1:0.0052; freq response, 300 to 3500 cps ±1 db; 9 solder lug term on bottom surface spaced ⅜" c to c and symmetrically arranged in 3 rows of three mtd by four #8-32 thd x 5 16" d tapped holes, on 1¾" x 2¼" mtg ctr on broad side of case; FTRC dwg FRE-18277-1, part no. A1002343 and spec MIL-T-27	Modulation
T401	N17-T-74411-5500	TRANSFORMER, power filament & plate type; input 115/230 v, 50/60 cps, 1 phase; 5 output wnd; secd #1 (term 5, 6, 7) 1440 v, 353 ma CT; secd #2 (term 8, 9) 6.4 v, 14 amp; secd #3 (term 10, 11) 5.1 v, 4 amp; secd #4 (term 12, 13) 63 v, 0.13 amp; secd #5 (term 14, 15) 19 v 0.66 amp; 5000 v ins; HS metal case; 6⅞" lg x 3½" wd x 4½" d o/a, excl term; 15 pillar type solder term 13/16" h on top of case; four ¼"-20 thd x ⅜" d holes (in inserts) on 3-13/16" x 4-25/32" mtg ctr on top of case; FTRC dwg FRE-18437-1; part no. A1002844 and spec MIL-T-27	Equipment Power
T402	N17-T-76152-1001	TRANSFORMER, power: filament type, 2:1 step-down; input 230 v, 50/60 cps, 1 phase; single output wnd, 115 v, 0.175 amp; potted; HS metal case; 2-1/16" sq x 3½" h o/a, incl term; four 1½" h ins pillar type solder term, spaced ⅜" x 1⅜" c to c on bottom of case; mtd by two #8-32 x ½" lg studs on opposite corners of 1⅜" square; FTRC dwg FRE-20433-1, part no. A1002937 and spec MIL-T-27	Control Voltage Supply
V101	N16-T-56211	TUBE, electron: JAN type 6BA6; pentode; spec JAN-1A	Speech Amplifier
V102	N16-T-58241	TUBE, electron: JAN type 12AU7; dual triode; spec JAN-1A	AVC Amplr (V102A) and AVC Rectifier (V102B)

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
V103	N16-T-56195	TUBE, electron: JAN type 6AL5; dual diode; spec JAN-1A	Clipper
V104		Same as V102	Filter Amplr (V104A) & Driver Amplr (V104B)
V105	N16-T-68070	TUBE, electron: JAN type 807; beam power tetrode; spec JAN-1A	Modulator
V106		Same as V105	Modulator
V107		Same as V102	Multivibrator
V108		Same as V103	Vol Expander Rect (V108A) and Modulation Indic (V108B)
V109	N16-T-56203	TUBE, electron: JAN type 6AT6; dual diode and triode; spec JAN-1A	MCW Osc (Triode) Vol Expander and Clamping (Diodes)
V110		Same as V102	Carrier Control
V401	N16-T-53228	TUBE, electron: JAN type 3B28; gas-filled diode; spec JAN-1A	Rectifier
V402		Same as V401	Rectifier
V601	N16-T-58240-10	TUBE, electron: JAN type 12AT7; dual triode spec JAN-1A; FTRC part no. 700155	RF Oscillator
V602		Same as V601	Doubler
V603		Same as V601	RF Amplr
V604	N16-T-54950	TUBE, electron: JAN type 4X150A; power tetrode; spec JAN-1A; FTRC part no. 700098	Tripler
V605		Same as V604	Power Amplr
V606		Same as V604	Power Amplr
W301	N17-C-48887-2951	CABLE ASSEMBLY, special purpose; CX-1826/U c/o 15 wires (incl shielded pair) in plastic sleeve; 8 ft lg between connectors; one H.B. Jones (CJC) #P-318-CCT male connector one end and one #S-318-CCT female connector other end; FTRC dwg FRW-28566-12, part no. A1003611 and wire list FRL-28567-1, part no. A1003635	Chassis to Cabinet Servicing Interconnection

W302	N17-C-488890-3151	CABLE ASSEMBLY, special purpose; CX-1827/U c/o 18 wires in plastic sleeve; 36″ lg between connectors; one Industrial Product Co. (CARO) #M-23A male connector one end and one #F-23A female connector other end; FTRC dwg FRW-28565-12, part no. A1003613-1	Modulator to Chassis Servicing Interconnection
W303	N17-C-48526-1006	CABLE ASSEMBLY, special purpose; CX-1828/U c/o 13 wires in plastic sleeve; 36″ lg between connectors; one Industrial Products Co. (CARO) #M-15B male connector one end and one #F-15B female connector other end; FTRC dwg FRW-28564-12, part no. A1003615-1	RF Unit to Chassis Servicing Interconnection
W601	*N16-C-11943-2350	CABLE ASSEMBLY, RF: AN type CG-409/U (0′, 6½″); JAN type RG-58/U coax cable with one JAN type UG-88/U connector each end; 6½″ (±⅛″) lg o/a; FTRC dwg FRE-24333-1, part no. A1001743-1	Tripler to PA Grid Coupling
XF401	N17-F-74266-9235	HOLDER, fuse: extractor post type; for type 3AG glass fuse; molded Bakelite body; 15 amps, 250 v rating 2-9/64″ lg x 11/16″ diam o/a; ½″-24 thd x ½″ lg bushing and ⅛″ thk x 11/16″ (between flats) hex nut; 2 solder lug term at rear; bayonet type removable retainer cap; RSW, FTRC part no. 746001	Holder for Fuse F401
XF402		Same as XF401	Holder for Fuse F402
XF403		Not used	
XF404		Same as XF401	Holder for Fuse F404
XI401	N17-L-76854-4200	LIGHT, indicator: with ½″ diam smooth red rear-frosted lens; for miniature bayonet base type T-3-¼ bulb; 0.8 watts at 28 v or less; encl shell, per Navy spec 17P5 type FBG, black nickel finish; Bakelite insert; 2-5/16″ lg x 13/16″ across flats; 11/16″ diam mtg hole; horiz mtg; lamp replaceable from front; threaded jewel; 2 solder lug term at rear; dims to blackout by 3 triangular holes; CAYZ series DV707, #98B2210-11-1, FTRC part no. 74402	Socket for Lamp I401
XI401A	17-L-51627-8393	LIGHT, indicator: w/o lens; accommodate ½″ dia lens; brass shell; black nickel pl; 1-5/16″ lg x 13/16″ across flats, requires 11/16″ dia mtg hole; 2 solder lug term, CAYZ #98B2210-11-1 less lens	p/o XI401
XI401B	17-L-250627-560	LENS, light: ½″ effective diam; red, rear-frosted; glass; screw-in mount; incl. mechanical dimmer for complete black-out, CAYZ #98B-1	p/o XI401
XI402	N17-L-76770-4445	Same as XI401, except green lens; Dial Light Corp series DV707, #98B-2210-11-2, FTRC part no. 744003	Socket for Lamp I402
XI402A		Same as XI401A	
XI402B	17-L-250305-452	LENS, light: ½″ effective diam; green rear-frosted; glass, screw-in mount; incl. mechanical dimmer for complete black-out CAYZ #98B-2	p/o XI402B

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
XV101	N16-S-62603-6700	SOCKET, tube: 7 cont miniature, 45° spacing; JAN type TS102CO1; mtd by ears on base of metal shock shield; two 1/8" diam mtg holes on 7/8" mtg ctrs; 0.625" diam chassis cut out required; cyl ceramic body; 1 1/8" wd x 0.805" d x 1-9/32" h o/a, incl 5/16" lg axial solder term and 0.125" ID x 5/16" lg ctr shield; spec JAN-S-28A	Socket for Tube V101
XV102	N16-S-64043-6713	SOCKET, tube: 9 cont noval miniature, 36° spacing; saddle base, above chassis mtg; two 1 1/8" diam mtg holes spaced 1 1/8" c to c in saddle; round mica filled Bakelite body 1 3/8" lg x 0.940" wd x 25/32" h, less term; 11/32" lg beryllium copper nickel pl spring cont; 0.160" ID ctr shield; 0.125" ID guide pin; solder lug tails on cont; stamped to permit use of tube shield; JAN type TS103P01; spec JAN-S-28	Socket for Tube V102
XV103		Same as XV101	Socket for Tube V103
XV104		Same as XV102	Socket for Tube V104
XV105	N16-S-61706-1481	SOCKET, tube: Navy type -49363; 5 cont medium; below chassis wafer mtg; two 0.170" diam mtg holes 1 3/4" c to c; oval ceramic body 2-5/16" lg x 1-11/16" wd x 1/4" h o/a excl term; phosphor-bronze silver pl cont; cont separated from ceramic base by cloth base lam ins, FTRC part no. 740035	Socket for Tube V105
XV106		Same as XV105	Socket for Tube V106
XV107		Same as XV102	Socket for Tube V107
XV108		Same as XV101	Socket for Tube V108
XV109		Same as XV101	Socket for Tube V109
XV110		Same as XV102	Socket for Tube V110
XV401	N16-S-60843-1405	SOCKET, tube: Navy type -49362; 4 cont medium; below chassis wafer mtg; two 0.170" diam mtg holes 1 3/4" c to c; oval ceramic body 2-5/16" lg x 1-11/16" wd x 17/64" h o/a, excl term; phosphor-bronze silver pl cont; cont separated from ceramic base by cloth base lam ins, FTRC part no. 740034	Socket for Tube V401
XV402		Same as XV401	Socket for Tube V402
XV601		Same as XV102	Socket for Tube V601
XV602		Same as XV102	Socket for Tube V602

XV603		Same as XV102	Socket for Tube V603
XV604	N16-S-63583-9006	SOCKET, tube: 8 cont lock-in; medium; one-piece saddle mtg; 1-25/32″ lg x 1-15/64″ wd; two 0.144″ diam holes on 1½″ mtg ctr; round ceramic body 1-3/64″ diam x 21/64″ h excl term; beryllium copper silver pl cont; CEB #7790, FTRC part no. 740040	Socket for Tube V604
XV605		Same as XV604	Socket for Tube V605
XV606		Same as XV604	Socket for Tube V606
Y601		CRYSTAL, quartz: harmonic mode; unit CR-24/U; frequency as specified; Government furnished	Frequency Control Position 1
Y602		Same as Y601	Frequency Control Position 2
Y603		Same as Y601	Frequency Control Position 3
Y604		Same as Y601	Frequency Control Position 4
Z101	N16-F-44056-2316	FILTER, low pass: 3500 cps cut-off freq; 4-15/32″ h x 2-11/16″ wd x 2¾″ d o/a, incl 15/32″ h term; 10,000 ohms input; rectangular metal case; mtd by two #8-32 thd x 5/16″ d tapped holes (in inserts) spaced 3″ x 2⅛″ c to c on side of case; four 15/32″ h pillar type ins solder term, located 11/16″ from rt edge, ⅝″ from front edge and ½″ c to c on top of case; FTRC dwg FRE-23197-1, part no. A1003102	Audio Filter

TABLE 8–3. MAINTENANCE PARTS KIT

KEY DESIG-NATION	QUANTITY	KEY DESIG-NATION	QUANTITY
A401	1	L401	1
A402	1	L402	1
A601	4	L403	1
B601	1	L601	1
C401	2	L602	1
C601	3	L603	2
C602	2	L604	2
C618	3	L608	1
C619A	2	L609	1
C619B	2	L610	1
C619C	1	L619	1
C622	4	O601	2
C642A	2	O602	2
C642B	2	O603	1
C642C	1	O608	2
CR401	1	P401	1
CR402	1	P402	1
E612	10	R617	1
E615	10	R618	1
J101	1	S402	1
J502	1	S601	2
J601	1	T101	1
J602	1	T102	1
K401	1	T103	1
K101	1	T401	1
K402	1	T402	1
K403	1	XV604	1
		Z101	1

TABLE 8–3A. MAINTENANCE PARTS KIT FOR T-336A/URT-7

KEY DESIG-NATION	QUANTITY	KEY DESIG-NATION	QUANTITY
A608	1	L601	1
C116	1	L603	1
C401	1	L608	1
C404	1	L619	1
C406	1	M401	1
C601	1	O601	2
C603	1	R119	1
C606	1	R123	1
C610	1	R147	1
C618	1	R412	1
C619A	1	R415	1
C619B	1	R417	1
C622	1	R601	1
C642A	1	R613	1
C642B	1	R617	1
CR401	2	R618	1
CR402	2	S601A	1
CR601	2	V101	2
E615	1 set	V102	2
F401*	10	V103	2
F401**	10	V105	2
F404	10	V109	2
I401	2	V401	2
K402	1	V601	3
K403	1	V604	3

TABLE 8—3B. MAINTENANCE PARTS KIT

KEY DESIG-NATION	QUANTITY	KEY DESIG-NATION	QUANTITY
A608	1	K401	1
B601	1	K402	1
C401	1	K403	1
C619.1-A	1	K404	1
C619.1-C	1	L401	1
C642.1-A	1	L402	1
C642.1-B	1	L403	1
C642.1-C	1	0601.1-1	2
C642.1-D	1	R617	1
C642.1-E	1	R618	1
CR401	1	S601A-1	1
CR402	1	T101	1
E615-1	4 sets	T102	1
F401	5	T103	1
K101	1		

TABLE 3—C. PARTS LIST—SHOP MANUFACTURED PARTS

The following items have been given the classification of Shop Manufacture.

A403-1***
to
A403-4***
A609***
C619.1-D***
C642.1-F***
C646***
C647***
E108***
E109***
E110***
E111***
E403***
R103***
R105***
H103***
H105***
L602***
L604***
L607***
L609***
L610***
to
L616***
L618***
L621***

TABLE 3—D. PARTS LIST—LOW FAILURE ITEMS

The following parts have been classified as Low Failure Items. If required, requisition form ESO referencing Nav Ships 900,180A.

A501***
A503***
A606***
A607***
E105***
H602-1***
to
H602-12***
H603-1***
to
H603-16***
H604-1***
to
H604-28***

TABLE 8–4. CROSS REFERENCE PARTS LIST

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
16-A-39380-1007[1]		16-C-71700-3920	L615	N16-R-50066-811	R143	N16-S-34576-6514	E103
16-C-10629-1689[2]		N16-C-72768-8717	L619	N16-R-50165-811	R134	N16-S-34576-6521	E603
N16-C-11943-2350	W601	N16-C-72841-1021	L608	N16-R-50200-751	R414	N16-S-60843-1405	XV401
N16-C-16093-3200	C606	N16-C-73043-1051	L603	N16-R-50200-976	R415	N16-S-61706-1481	XV105
N16-C-16253-7100	C615	N16-C-73313-1069	L601	N16-R-50281-431	R616	N16-S-62603-6700	XV101
N16-C-16254-5400	C603	N16-C-76198-5144	L609	N16-R-50281-976	R614	N16-S-63583-9006	XV604
N16-C-16799-4750	C610	16-C-76233-5005	L604	N16-R-50335-431	R106	N16-S-64043-6713	XV102
N16-C-17086-5795	C129	16-C-76320-5962	L602	N16-R-50335-936	R611	N16-S-854061-102	A502
N16-C-17856-4575	C121	N16-D-46337-9481	E605	N16-R-50337-528	R109	N16-T-43276-1083	S601
N16-C-18653-9200	C601	N16-D-46337-9483	E105	N16-R-503580-218	H105	N16-T-51721-10	CR601
16-C-18659-7772	C622	N16-D-46337-9485	E408	N16-R-50372-126	R612	N16-T-53228	V401
16-C-18660-1582	C618	N16-D-46337-9487	E104	N16-R-50373-231	R110	N16-T-54950	V604
N16-C-18692-1100	C602	N16-D-46337-9489	E607	N16-R-50416-431	R610	N16-T-56195	V103
N16-C-19786-3791	C111	N16-D-46337-9491	E606	N16-R-50418-457	R128	N16-T-56203	V109
N16-C-20461-8100	C406	N16-D-901161-135	O606	N16-R-50515-976	R613	N16-T-56211	V101
N16-C-20931-7851	C404	N16-D-901161-136	O605	N16-R-50552-126	R417	N16-T-58240-10	V601
N16-C-301801-585	H104	16-D-901161-162	O607	N16-R-50554-291	R122	N16-T-58241	V102
N16-C-304055-501	H601	N16-F-44056-2316	Z101	N16-R-50633-125	R105	16-T-37275-1301[5]	
N16-C-30698-5321	C619	N16-K-700266-881	E609	N16-R-50633-811	R104	N16-T-68070	V105
N16-C-31095-6644	C114	N16-L-150001-130	H402	N16-R-50634-501	R127	16-T-98076-2401	C645
N16-C-32435-6608	C106	N16-L-150001-131	H401	N16-R-50714-811	R108	16-T-751512-134	H101
N16-C-32651-9288	C116	N16-L-150001-132	H405	N16-R-50759-811	R112	N16-V-230001-103	B601[6]
N16-C-41627-6350	C102	16-M-42244-1875[3]		N16-R-50822-811	R107	17B-21188-4040	B601[6]
N16-C-44287-7140	C108	N16-M-61036-1051	C637C	N16-R-50893-431	R135	N17-B-21188-4050	B601
N16-C-45807-8094	C120	16-P-68314-1001[4]		N16-R-50975-811	R102	N17-B-77936-5240	E502
N16-C-47297-3180	C410	N16-P-401281-166	C646	N16-R-51020-811	R103	N17-B-78027-3069	E109
N16-C-48810-4190	C126	N16-P-500001-143	E610	N16-R-63918-2653	R618	N17-B-78035-5169	E111
N16-C-49221-9883	C101	N16-P-94101-1008	H103	N16-R-65755-7316	R410	N17-B-78084-7790	E403
N16-C-49981-9560	C408	N16-R-29758-4501	L402	N16-R-65846-2001	R409	N17-B-78114-7769	E108
N16-C-51861-2442	C401	N16-R-29765-7385	L403	N16-R-66030-9926	R408	N17-B-78188-5969	E110
N16-C-54460-4481	C104	N16-R-29783-2100	L401	N16-R-66168-2450	R407	N17-B-86231-1301	E612
N16-C-54535-8175	C412	N16-R-49282-431	R404	N16-R-66329-6741	R418	N17-B-86311-8661	E615
N16-C-55679-6288	C642	N16-R-49363-431	R401	N16-R-68297-7246	R406	N17-C-201579-715	J401A
N16-C-58139-1980	C604	N16-R-49498-431	R601	N16-R-68369-8466	R412	N17-C-201579-717	J402A
N16-C-58445-6331	C611	N16-R-49582-291	R119	N16-R-70195-1001	R617	N17-C-48526-1006	W303
N16-C-2067-7300	C638	N16-R-49588-431	R402	N16-R-87349-4418	R411	N17-C-48887-2951	W301
N16-C-63457-9641	C637	N16-R-49624-751	R147	N16-R-88009-4213	R115	N17-C-48890-3151	W302
N16-C-63465-8921	C605	N16-R-49660-431	R602	N16-R-88009-4520	R113	N17-C-67443-6230	E401
N16-C-64232-8500	C124	N16-R-49687-431	R605	N16-R-88079-4135	R101	N17-C-71317-6092	J501
16-C-71598-6575	L618	N16-R-49708-291	R413	N16-R-88339-4481	R121	N17-C-71408-3241	P501
N16-C-71613-1970	L612	N16-R-49768-431	R606	N16-R-88412-5369	R131	N17-C-71416-2550	P503
16-C-71627-1968	L610	N16-R-49804-431	R403	N16-R-94402-1489	C645A	N17-C-72252-1001	J403
16-C-71651-8451	L614	N16-R-49876-431	R123	N16-R-94402-1530	C637D	N17-C-73108-7477	J602
16-C-71651-9806	L613	N16-R-49939-431	R117	N16-S-34520-3864	E101	N17-C-73114-7071	J502
N16-C-71662-7638	L611	N16-R-50011-976	R603	N16-S-34557-8351	E102	N17-C-73309-7501	J601

[1]Amplifier-Oscillator AM-638/URT
[2]Cabinet, Electrical Equipment CY-1126/URT
[3]Modulator, Radio MD-163/URT
[4]Power Supply PP-773/URT
[5]Transmitter, Radio T-336/URT-7
[6]Supplied alternatively.

TABLE 8—4. CROSS REFERENCE PARTS LIST (Cont)

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	JAN DESIGNATION	KEY SYMBOL	JAN DESIGNATION	KEY SYMBOL
N17-C-73330-5001	J101	17-L-250627-560	XI401B	CE41C122F	C404	RC20BF271J	R605
N17-C-73597-1001	P402	N17-M-21895-3688	N401	CE41C201H	C406	RC20BF330J	R401
17-C-73605-9149	P403	N17-P-70009-4001	A403	CE63C250H	C111	RC20BF331M	R413
N17-C-73627-1001	P401	N17-R-51053-8320	CR401	CM30B102M	C114	RC20BF332K	R143
N17-C-77409-5001	A601	N17-R-51277-2831	CR402	CM35B392K	C106	RC20BF333J	R610
N17-C-77413-2201	A402	N17-R-64123-7121	K402	CM35B472M	C116	RC20BF334K	R112
N17-C-77417-3587	A401	N17-R-65331-9819	K101	CP20A3EF602M	C102	RC20BF471J	R606
N17-C-77417-8001	A604	N17-R-65528-1801	K401	CP26A1EF104M	C120	RC20BF474K	R107
N1-C-77417-8003	A605	N17-R-65577-6501	K403	CP26A1EF503M	C108	RC20BF561J	R403
N17-C-77417-8006	A602	N17-S-50963-2625	E601	CP53B1EB405V	C408	RC20BF562K	R134
N17-C-77417-8008	A603	N17-S-50972-6851	E503	CP53B1EC105K	C126	RC20BF680J	R601
N17-C-79659-5001	C619C	N17-S-62523-1361	S101	CP53B1EF205V	C101	RC20BF683M	R122
N17-C-79663-9001	C642C	N17-S-63671-8620	S401	CP53B5EF104V	C104	RC20BF684J	R135
N17-C-800487-701	E107	N17-S-72018-7719	S102	CP54B1EF504K	C410	RC20BF821J	R123
N17-C-81967-5001	S601A	N17-S-72396-1685	S405	CV12D121	C124	RC30BF151J	R147
N17-C-965001-240	A606	N17-S-72396-1705	S402	JAN-1N21B	CR601	RC30BF223K	R110
N17-C-98431-6201	O604	N17-S-73082-9028	S403	JAN-3B28	V401	RC30BF682J	R414
N17-C-98431-6221	O603	N17-S-74139-4844	S103	JAN-4X150A	V604	RC42BF103J	R614
N17-F-14305-60	F401[1]	N17-T-28218-4116	H406	JAN-6AL5	V103	RC42BF104K	R127
N17-F-14306-510	F402[2]	N17-T-61047-1200	T101	JAN-6AT6	V109	RC42BF153J	R611
17-F-16302-40	F404	N17-T-63251-8800	T103	JAN-6BA6	V101	RC42BF222J	R603
17-F-74266-9235	XF401	N17-T-65004-7500	T102	JAN-12AT7	V601	RC42BF223J	R612
N17-G-157386-516	A501	N17-T-74411-5500	T401	JAN-12AU7	V102	RC42BF333K	R128
N17-I-47363-4201	E405	N17-T-76152-1001	T402	JAN-807	V105	RC42BF563J	R613
N17-I-48679-2401	E404	G41-W-2449	H102	JJ-033	J401	RC42BF682J	R415
N17-I-49498-4210	E604	N42-C-13390-2025	H404	MR25W163SPEC	M401	RC42BF683J	R417
N17-I-59404-5595	E611	N42-L-2605-8075	H602	NS3W0104	E614	RW33G401	R409
N17-I-64046-1240	C619A	N42-L-2605-8100	H603	NS3W0205	E406	RW33G712	R418
N17-I-64046-1245	C619B	N42-L-2605-8250	H403	NS3W0208	E613	RW34G102	R408
N17-I-64286-9001	C605E	N43-S-17365-210	H107	NS3W4101	E404	RW34G312	R407
N17-I-64287-6651	C637F	N43-S-17365-215	H106	NS3W4201	E405	RW36G201	R410
N17-I-64841-9841	C642A	N43-W-5994-9510	H605	RC20BF101M	R119	RW55J5R0	R406
N17-I-64841-9846	C642B	N43-W-7104-3040	H407	RC20BF103J	R616	RW56J251	R412
N17-I-67024-2401	C637E	N77-B-118-00865-3004	O602	RC20BF104J	R105	ST12D	S102
N17-I-69154-6196	E614			RC20BF104K	R104	ST22K	S403
N17-I-69173-7101	E406			RC20BF105K	R102	ST22N	S103
N17-I-69178-7126	E613	**JAN DESIGNATION**	**KEY SYMBOL**	RC20BF111J	R402	ST40G	S402
N17-J-39248-4423	J402			RC20BF122J	R117	ST42H	S405
N17-J-39420-4297	J401			RC20BF150J	R404	TS102C01	XV101
N17-L-6543-200	I401	CC21SH200K	C606	RC20BF153J	R106	TS102U01	E101
17-L-51627-8393	XI401A	CC21SL270K	C615	RC20BF153K	R109	TS102U02	E102
N17-L-76770-4445	XI402	CC21UJ270K	C603	RC20BF155K	R103	TS103P01	XV102
N17-L-76854-4200	XI401	CC26UJ101K	C129	RC20BF221J	R602	TS103U02	E103
17-L-250305-452	XI402B	CC36RK181J	C121	RC20BF224K	R108		

[1]For 115-v line.
[2]For 230-v line.

ORIGINAL

TABLE 8—4. CROSS REFERENCE PARTS LIST (Cont)

ARMY-NAVY TYPE	KEY SYMBOL	NAVY TYPE NO.	KEY SYMBOL	NAVY/BUSHIPS DWG. NO.	KEY SYMBOL		
AM-638/URT[1]		-28060-4	F401	RE49AA195	J402		
AN-3102-14S-5S	J403	-482263-10	C401	RE49F246	P501		
CG-409/U	W601	-49025B	J402	RE49F429	E401		
CR-24/U	Y601	-49039A	J401				
CX-1826/U	W301	-49362	XV401				
CX-1827/U	W302	-49363	XV105				
CX-1828/U	W303	-53183	E503				
CY-1126/URT[2]							
MD-163/URT[3]							
PP-773/URT[4]							
T-336/URT-7[5]							
UG-21B/U	P503						
UG-88/U	P501						

[1]Amplifier-Oscillator AM-638/URT
[2]Cabinet, Electrical Equipment CY-1126/URT
[3]Modulator, Radio MD-163/URT
[4]Power Supply PP-773/URT
[5]Transmitter, Radio T-336/URT-7

TABLE 8—4A. CROSS REFERENCE PARTS LIST FOR MODEL T-336A/URT-7

REFERENCE DESIGNATION	RAULAND-BORG DWG. NO.	AIR FORCE STOCK NO.
A401	AG-4393	1760-048386923
A402	AG-4394	1760-048386924
A403-1	BG-1507	
to A403-4		
A501	QR-0285	
A502-1	AG-4416	
to A502-4		
A503	QR-0293	
A601-1	AC-4395	1760-048386925
to A601-4		
A602	AC-4396	1760-048386926
A603	AC-4397	1760-048386927
A604	AC-4398	1760-048386928
A605	AC-4399	1760-048386929
A606	QR-0291	
A607	QR-0290	
A608	AG-4380	
A609	AG-4415	
B601	PG-0009	
C101	CP53B1EF205V	3330-317094982
C102	CP20A3EF602M	3330-056750111
C104	CP53B5EF104V	3330-316777673
C106	CM35B392K	3330-376148400
C108	CP28A1EF503M	3330-316163541
C111	CE63C250H	3330-317536628
C114	CM30B102M	3330-376120000
C116	CM35B472M	3330-055950336
C118	CP29A1EF503M	3330-317704006
C120	CP28A1EF104M	3330-317760080
C121	CC36RH181J	3330-055350320
C124	CV12D121	3330-313938030
C126	CP53B1EC105K	3330-316958803
C129	CC26UJ101K	3330-313889909
C401	CO-106A	3330-057252400
C404	CE41C122F	3330-317630207
C406	CE41C201H	3330-055600044
C408	CP53B1EB405V	3330-317643023
C410	CP54B1EF504K	3330-319001133
C412	CP-754	3330-057252402
C601	CC-102G	3330-055475610
C602	CC-122	3330-055475615
C603	CC21UJ270K	3330-055350163
C604	CV-090C	3330-312944200
C605	CV-111	3330-058100161
C606	CC21SH200J	3330-055350270
C610	CC-680C	3330-055475617
C611	CV-150E	3330-313050500
C618	CC-102E	3330-055475140
C619	VG-2871	
C619A	AC-1301	3320-082354760
C619B	AC-1302	3320-082354765
C619C	AG-4400	1760-048832110
C619D	AG-4624	
C622	CC-102F	3330-055475140
C637	CV-580	3330-058100166
C638	VC-080A	3330-312944011
C642	GV-2872	
C642A	AC-1303	3320-082354775
C642B	AC-1304	3320-082354770
C642C	AG-4402	1760-048832112
C642D	VG-2911	
C645A	VG-2801	
C646	CV-050A	
CR401	JR-0020	3370-679750-2164
CR402	JR-0021	3370-679750-1128
CR601	EG-1N21B	3370-211000-2145
E101-1	JS-0186	3370-774000-1925
thru		
E101-2		
E102-1	JS-0181	3370-774000-1955
thru		
E102-2		
E103-1	JS-0197	3370-774000-2185
thru		
E103-4		
E105	VG-2771	3320-080151185
E107	VG-2760	1760-049664500
E108	VT-0306	8880-501674-6285
E109	VT-0307A	
E110	VT-0308	8880-502574-4855
E111	VT-0309	8880-501474-7055
E401	SM-0200	8850-108900
E402	VG-2739	3320-080151190
E403	VT-0320	
E404-1	QC-0113	3330-018550040
thru		
E404-2		
E405-1	QC-0114	3320-333767001
thru		
E405-2		
E406-1	QC-0117	3320-082740030
thru		
E406-4		
E407	VG-2736	3320-080151165
E408	VG-2740	

TABLE 8—4A. CROSS REFERENCE PARTS LIST FOR MODEL T-336A/URT-7 (Cont)

REFERENCE DESIGNATION	RAULAND-BORG DWG. NO.	STOCK NO. AIR FORCE
E409-1 thru E409-2	VG-2742	8850-433000-3155
E501	TS-0199	8880-501054-2855
E503	LC-0211	3330-058750196
E601	LC-0212	3330-058750198
E603-1 thru E603-3	JS-0196	
E604-1 thru E604-4	QP-0326	3320-081553205
E605	VG-2737	3320-080151170
E606	VG-2738	3320-080151160
E607	VG-2741	3320-080151155
E608	VG-2910	
E609-1 thru E609-3	BG-1508	3320-083351718
E610-1 thru E610-3	QD-0238	3320-084409215
E611-1 thru E611-5	QC-0112	8880-700775-3445
E613-1 thru E613-4	QC-0115	
E614-1 thru E614-2	QC-0116	3320-333730606
E615-1 thru E615-2	AG-4604	7700-050076
E616-1 thru E616-2	QC-0108	3340-061875050
E617-1 thru E617-2	QC-0110	3340-061875060
E618-1 thru E618-3	VG-2752	3340-061750280
E619	QM-0003	
E620-1 thru E620-2	QC-0111	3320-081553225
E621	QC-0118	3320-081553210
E622	QC-0119	3320-081553200
F401**	F-0046	8870-212000-445
F401***	F-0045	8870-212000-355
F404	F-0044	8870-112000-722
H101	AG-4405	7900-662653
H102	AG-4406	
H103	AG-4407	9CRG-AG4407
H105	VG-2751	1760-048387360
H108	BG-1512	8880-821500-1457
H401	VG-2743	1760-047802503
H402	VG-2744	1760-047802504
H403	BG-1617	
H404	AG-4470	6500-914701-4
H405-1 thru H405-2	BG-1571	6500-916648-495
H406-1 thru H406-16	BG-1349	8880-893000-1215
H407-1 thru H407-2	WR-0065	
H601	VG-2763	
H602-1 thru H602-12	VG-2757	6500-916055
H603-1 thru H603-16	VG-2758	
H604-1 thru H604-28	AG-4419	6500-631331
H605-1 thru H605-28	WK-0044	
I401	JL-0023	8870-938000-465
J101	SF-0240	8850-601960
J401	AG-4410	8850-767589
J401A	AG-4411	8850-697861
J402	AG-4412	8850-749430
J402A	AG-4413	8850-697862
J403	SF-0244	8850-541632
J403A	AG-4409	8850-086630
J501	SF-0235	
J502	SF-0238	8850-482975
J601	SF-0239	
J602	SF-0237	8850-490135
K101	D-0076	3380-552180-2185

TABLE 8–4A. CROSS REFERENCE PARTS LIST FOR MODEL T-336A/URT-7 (Cont)

REFERENCE DESIGNATION	RAULAND BORG DWG. NO.	AIR FORCE STOCK NO.
K401	D-0077	3380-55210-55165
K402	D-0078	3380-55210-5498
K403	D-0079	3380-511125-1135
L401	LC-0213	3340-062457290
L402	LC-0214	3340-062457280
L403	LC-0215	3340-062457310
L601	LC-0210	3340-307655416
L602	VG-2892	
L603	LC-0209	3340-307655418
L604	VG-2895	
L607	VG-2894	
L608	LC-0208	3340-307655417
L609	VG-2893	
L610	LW-0087	
L611	LW-0060	3340-060717350
L612	LW-0061	3340-060717380
L613	LW-0085	
L614	LW-0079	
L615	LW-0091	
L616	LW-0093	
L618	LW-0089	
L619	LC-0207	3340-310190455
L621	LW-0095	
M401	M-0043	0809-MR25W163SPEC
O601-1 thru O601-2	AC-1326	1760-049718000
O602	BG-1511	
O603	BG-1510	3330-058620001
O604	VG-2869	
O605	VG-2746	1760-046711030
O606	VG-2747	1760-046711032
O607	VG-2888	
O608-1 thru O608-2	BG-1509	
P301	SM-0197	8850-364465
P302	SF-0234	8850-36400
P401	SM-0202	8850-0603024
P402	SM-0201	8850-587450
P403	SM-0204	8850-592712
P501	SM-0199	8850-468450
P503	SM-0188	8850-467460
R101	RP-254M	3350-793000-4368
R102	RC20GF105K	3350-09800-6511
R103	RC20GF155K	3350-101000-6631
R104	RC20GF333K	3350-103000-5866
R105	RC42GF104J	3350-146000-5457
R106	RC20GF153J	3350-098000-4551
R107	RC20GF474K	3350-098000-6191
R108	RC20GF224K	3350-098000-5771
R109	RC42GF153K	3350-146000-4557
R110	RC30GF223K	3350-128000-5315
R112	RC20GF334K	3350-098000-5931
R113	RP-104V	3350-793000-3864
R117	RC20GF122J	3350-098000-2951
R119	RC20GF101K	3350-09800-2271
R121	RP-105Z	3350-793000-4922
R122	RC20GF683K	3350-098000-5291
R123	RC20GF821J	3350-098000-3251
R127	RC42GF104K	3350-146000-5457
R128	RC42GF333K	3350-146000-4877
R131	RP-255D	3350-793000-54355
R134	RC20GF562K	3350-098000-4151
R135	RC20GF684K	3350-098000-6351
R143	RC20GF332K	3350-098000-3811
R147	RC30GF151J	3350-128000-2935
R401	RC20GF330J	3350-098000-1691
R402	RC20GF111J	3350-098000-2311
R403	RC20GF561J	3350-098000-2991
R404	RC20GF150J	3350-098000-1371
R406	RW55J5RO	3350-49200-1485
R407	RW34G312	3350-551000-2315
R408	RW34G102	3350-551000-1819
R409	RW33G401	3350-533000-23545
R410	RW36G201	3350-577000-1473
R411	RV4ATRD102A	3350-793000-1682
R412	RW55J251	3350-492000-3239
R413	RC20GF331K	3350-098000-2751
R414	RC30GF682J	3350-128000-4735
R415	RC42GF682J	3350-146000-4237
R417	RC42GF683J	3350-146000-5297
R418	RW33G712	3350-533000-2659
R601	RC20GF680J	3350-098000-2111
R602	RC20GF221J	3350-098000-3411
R603	RC42GF222J	3350-146000-3657
R605	RC20FG271J	3350-098000-2671
R606	RC20GF471J	3350-098000-2911
R610	RC20GF333J	3350-098000-4871
R611	RC42GF153J	3350-146000-4557
R612	RC42GF223J	3350-146000-4717
R613	RC42GF563J	3350-146000-5271
R614	RC42GF103J	3350-146000-4397
R616	RC20GF103J	3350-098000-4391
R617	RW-3012	3350-492000-1113
R618	RW-4072	3350-492100-1112

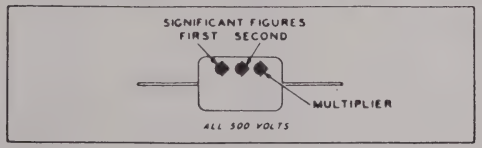
TABLE 8—4A. CROSS REFERENCE PARTS LIST FOR MODEL T-336A/URT-7 (Cont)

REFERENCE DESIGNATION	RAULAND BORG DWG. NO.	AIR FORCE STOCK NO.	REFERENCE DESIGNATION	RAULAND BORG DWG. NO.	AIR FORCE STOCK NO.
S101	X-0289	3360-073114236	V109	EG-6AT6	3370-265000-6135
S102	X-0281	3360-395853398	V401	EG-3B28	3370-433000-3155
S103	X-0279	3360-395853615	V601	EG-12AT7WA	3370-316000-1369
S401	X-0290	3360-073114237	V604	EG-4X150A	3370-445000-4235
S402	X-0282	3360-395853389	W301	VW-0796	1760-045645010
S403	X-0280	3360-395853600	W302	VW-0797	1760-045645012
S405	X-0285	3360-395853402	W303	VW-0798	1760-045645014
S601	VG-2749	1760-049586700	W601	VW-0429	1760-045640020
S601A-1 thru S601A-2	AG-4414		XF401	SF-0236	8870-556000-555
			XI401	SL-0057	7700-535065-5232
			XI401A	SL-0066	
T101	LA-0053	3340-062754520	XI401B	SL-0064	
T102	LM-0058	3340-062754540	XI402	SL-0058	7700-547943-522
T103	LH-0001	3340-062754530	XI402B	SL-0065	7700-527247.26653
T401	LP-0234	3340-062904260	XV101	ST-700Z	8850-882870
T402	LP-0235	3340-063857660	XV102	ST-900C	8850-896590
V101	EG-5749	3370-286000-5755	XV105	ST-500P	8850-880200
V102	EG-5814A	3370-265000-5815	XV401	ST-400Z	8850-874627
V103	EG-5726	3370-259000-5795	XV604	ST-900D	8850-886238
V105	EG-807	3370-427000-8185	Z101	LC-0216	1760-046868100
			Z601	VG-2918	

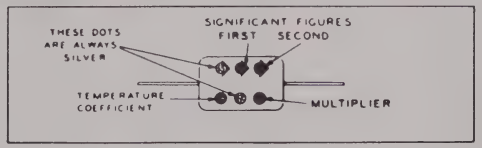
TABLE 8—5. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

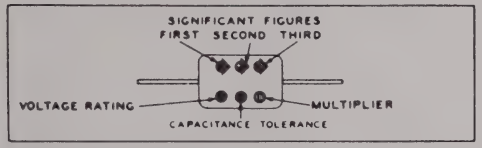
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



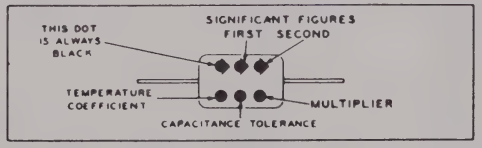
JAN 6 DOT COLOR CODE FOR PAPER DIELECTRIC CAPACITORS



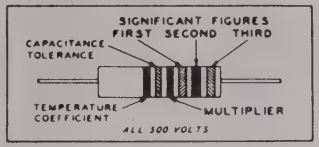
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

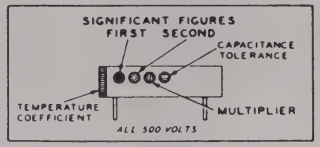


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

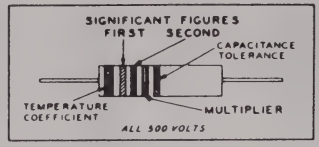


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



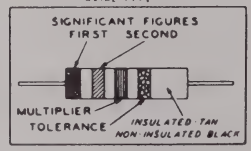
RMA RADIO MANUFACTURERS ASSOCIATION
JAN JOINT ARMY-NAVY

RESISTORS		CAPACITORS						
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1000	3	ORANGE	1000	1000	1000	300	D
	10000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

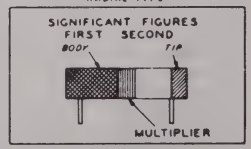
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

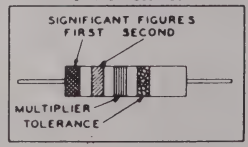


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON INSULATED

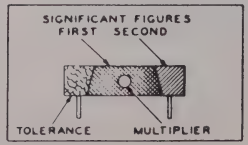


TABLE 8—6. LIST OF MANUFACTURERS

PREFIX	NAME	ADDRESS
CAMQ	Cambridge Thermionic Corp.	445 Concord Ave., Cambridge, Mass.
CARO	Industrial Products Co.	Brookfield St., Danbury, Conn.
CASN	Howard Industries, Inc. Electric Motor Corp. Division	1215 State St., Racine, Wis.
CAW	Aerovox Corp.	742 Belleville Ave., New Bedford, Mass.
CAXD	Insuline Corp. of America	30-30 Northern Blvd., Long Island City, N. Y.
CAYT	The Allen Mfg. Co.	100 Sheldon St., Hartford, Conn.
CAYZ	Dial Light Corp.	900 Broadway, New York, N. Y.
CBEF	Electrical Industries, Inc.	42 Summer Ave., Newark, N. J.
CBN	Centralab Division Globe-Union, Inc.	900 East Keefe Ave., Milwaukee, Wis.
CBZ	Allen-Bradley Company	118 West Greenfield Ave., Milwaukee, Wis.
CD	Cornell-Dubulier Corp.	1000 Hamilton Blvd., So. Plainfield, N. J.
CEB	Hugh H. Eby	4700 Stenton Ave., Philadelphia, Pa.
CEJ	E. F. Johnson Company	Waseca, Minn.
CER	Erie Resistor Corp.	644 W. 12th St., Erie, Pa.
CFA	Bussman Mfg. Company	2538 W. University St., St. Louis, Mo.
CFT	Federal Telephone and Radio Corp.	100 Kingsland Road, Clifton, N. J.
CG	General Electric Company	1 River Road, Schenectady, N. Y.
CGM	General Motors Corp. New Departure Div.	Bristol, Conn.
CJA	James Millen Manufacturing Co., Inc.	150 Exchange St., Malden, Mass.
CJC	Howard B. Jones	2300 W. Wabansia Ave., Chicago, Ill.
CMBX	Rotron Manufacturing Co.	7-9 Schoonmaker Lane, Woodstock, N. Y.
CMG	Cinch Mfg. Co.	2339 W. Van Buren St., Chicago, Ill.
CNA	National Co., Inc.	61 Sherman St., Malden, Mass.
COM	Ohmite Mfg. Co.	4835 W. Flournoy St., Chicago, Ill.
CSD	Struthers Dunn, Inc.	144 North 13th St., Philadelphia, Pa.
CTD	Tobe-Deutschmann Corp.	921 Providence Highway, Norwood, Mass.
	Camloc Fastener Co.	420 Lexington Ave., New York, N. Y.
	Fafnir Bearing Co.	6 W. 60th St., New York, N. Y.
	Pure Carbon Co.	St. Marys, Pa.

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